Vol. LXIII No. 4 OCTOBER 1961 50 CENTS

CANADIAN GEOGRAPHICAL JOURNAL

W. G. Campbell

CONTENTS:

Published by THE ROYAL CANADIAN GEOGRAPHICAL SOCIETY

How do I save?

If there's a fool-proof way to save I have yet to hear of it. But one thing I do know: the "Royal's" 2-Account Plan makes saving a whole lot easier.

Try it out. Use a "Personal Chequing Account" to pay your household bills. Keep your Savings Account separate—an account reserved *for saving only.*

It works. Because with two separate accounts you can curb that natural urge to dip into your savings; you can actually *see* your savings grow.

THE ROYAL BANK OF CANADA

The bank with 1,000 front doors

Christmas Gift Memberships

To:—The Executive Secretary
The Royal Canadian Geographical Society
54 Park Avenue, Ottawa 4, Ontario

Please enroll the following persons as members of the Royal Canadian Geographical ociety. I understand that this will entitle them to receive the *Canadian Geographical Journal* r one year, commencing with the December issue this year. The greeting card sent to the cipient by the Society should be inscribed as coming from

.....

ame.....
ddress.....
.....

For office use only

Name.....
Address.....
.....

For office use only

ame.....
ddress.....
.....

For office use only

Name.....
Address.....
.....

For office use only

(ADDITIONAL NAMES MAY BE LISTED ON REVERSE SIDE)

I enclose $5.00 for each of the memberships listed above $.....

Donor's own membership $..... Total $.....

Donor's Name.....

Address.....

.....

For office use only

Note:—**Owing to rising costs we have been forced to discontinue the special gift rate, therefore all membership fees are now $5.00 each for one year.**

Christmas Gift Membership

To—The Executive Secretary
The Royal Canadian Geographical Society
54 Park Avenue, Ottawa 4, Ontario

Please enroll the following persons as members of the Royal Canadian Geographical Society. I understand that this will entitle them to receive the Canadian Geographical Journal commencing with the December issue. The gift card sent to the person by the Society should be addressed as coming from

Name

Address

Name

Address

(ADDITIONAL NAMES MAY BE LISTED ON REVERSE SIDE)

I enclose $5.00 for each of the memberships listed above.

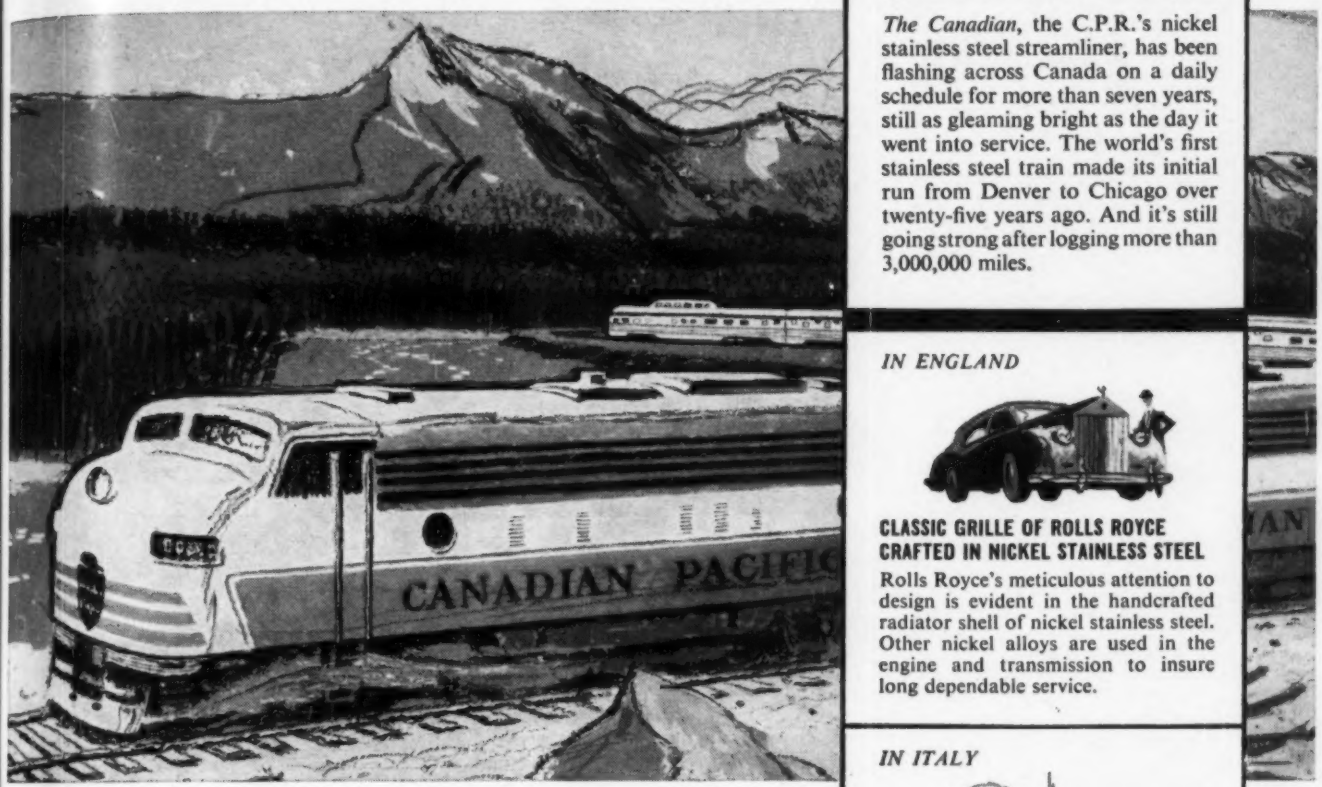
Donor's Signature

Donor's Name

Address

For office use only

INCO DEVELOPS WORLD MARKETS FOR NICKEL



NICKEL STAINLESS STEEL TRAINS LIKE NEW AFTER 25 YEARS!

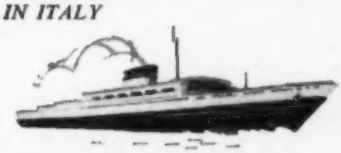
The Canadian, the C.P.R.'s nickel stainless steel streamliner, has been flashing across Canada on a daily schedule for more than seven years, still as gleaming bright as the day it went into service. The world's first stainless steel train made its initial run from Denver to Chicago over twenty-five years ago. And it's still going strong after logging more than 3,000,000 miles.

IN ENGLAND

CLASSIC GRILLE OF ROLLS ROYCE CRAFTED IN NICKEL STAINLESS STEEL

Rolls Royce's meticulous attention to design is evident in the handcrafted radiator shell of nickel stainless steel. Other nickel alloys are used in the engine and transmission to insure long dependable service.

IN ITALY



NEW *LEONARDO DA VINCI* USES STAINLESS, OTHER NICKEL ALLOYS

The new Italian luxury liner *Leonardo da Vinci* uses gleaming nickel stainless steel and bright nickel silver for hardware and ornamental accessories, strong, tough and durable nickel alloy steels for heavy duty engine parts.

IN THE UNITED STATES

NEW JET AIRCRAFT PROMISE HIGHER SPEEDS FOR COMMERCIAL FLIGHT

Designers are planning jets capable of reaching Mach 3 (approximately 2100 miles an hour). At these speeds, nickel stainless steel and other special nickel alloys are necessary to withstand intense heat and high stresses.

Modern transportation builds world markets for nickel

Nickel stainless steel is used widely throughout the world in the construction of modern streamlined trains, planes, ocean liners and automobiles—because of its bright beauty and ability to withstand corrosion and high temperatures.

Nickel alloy steels are the strong, tough, durable materials that carry the load in modern transportation. They're used for automotive transmissions and engine parts, for the heavy duty machinery and structural parts of ocean-going ships and lake freighters, for planes, trains, trucks and buses.

Canada is the world's largest producer of nickel. And Inco, through sales, research and market development operations, maintains a continuing program for the expansion of international markets for Inco nickel.

More Inco nickel than ever before will be exported to Inco's expanding world markets . . . helping to build trade balances, stimulate Canada's economic growth and create more jobs for Canadians.

THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED

INCO TRADE MARK

55 YONGE STREET, TORONTO

As we see the ducks fly south this fall in sadly depleted numbers, let us hope that next spring when we welcome them back they will find better living conditions on our Canadian Prairies.

By courtesy of the *Blue Bell*.

✦

The Society's ambition is to make itself a real force in advancing geographical knowledge, and in disseminating information on the geography, resources and people of Canada. In short, its aim is to make Canada better known to Canadians and to the rest of the world.

As one of its major activities in carrying out its purpose, the Society publishes a monthly magazine, the Canadian Geographical Journal, which is devoted to every phase of geography — historical, physical and economic — of Canada, of the British Commonwealth and of the other parts of the world. It is the intention to publish articles in this magazine that will be popular in character, easily read, well illustrated, and informative.

The Canadian Geographical Journal will be sent to each member of the Society in good standing. Membership in the Society is open to any one interested in geographical matters. The annual fee for membership is five dollars (U.S. funds at par).

AUTHORIZED AS SECOND CLASS MAIL BY THE POST OFFICE DEPARTMENT, OTTAWA, AND FOR PAYMENT OF POSTAGE IN CASH.

PRINTED IN CANADA

CANADIAN GEOGRAPHICAL JOURNAL

Editor - WILLIAM J. MEGILL

CONTENTS

OCTOBER 1961 ✦ VOLUME LXIII ✦ NUMBER 4

COVER SUBJECT:—*Geological helicopter on sandbar, northern Yukon.*
W. G. Campbell

✦

The articles in this Journal are indexed in the *International Index to Periodicals* and in the *Canadian Index*.

The British standard of spelling is adopted substantially as used by the Government of Canada and taught in most Canadian schools, the precise authority being the Concise Oxford Dictionary, fourth edition, 1951.

Financial assistance from the Canada Council towards publication of the *Canadian Geographical Journal* is gratefully acknowledged. The fact that a grant has been made does not imply, however, that the Canada Council endorses or is responsible for the statements or views expressed in the Journal.

Address all communications regarding change of address, non-delivery of Journal, etc., to the Head Office, 54 Park Avenue, Ottawa 4, Canada, giving old and new address. On all memberships, the expiry date will be printed on wrapper. This will constitute a receipt for subscription.

Member Audit Bureau of Circulations

Head Office: 54 Park Avenue, Ottawa 4
(Tel. CE. 6-7493)

Printing Office: Gazette Printing Company (Limited),
1000 St. Antoine St., Montreal 3.

SPECIAL REPRESENTATIVES:

GEORGE F. HENDERSON
1103 Mayor Bldg., Montreal 2
(Tel. VI. 9-3571 or UN. 6-5285)

69 Yonge St., Toronto
(Tel. EM. 3-4170)

Europe: S/L W. H. CORKILL, M.B.E.,
The Mead, West Dumpton Lane,
Ramsgate, Kent, England.

U.S.A.: Professor WILLIAM L. MAYO,
P.O. Box 1, Ann Arbor, Michigan.


NORTHERN YUKON
LEGEND
Mountain rim
Other topographical features
Subdivisions
Note: Geographical names subject to revision
Scale of Miles
0 20 40 60
ARCTIC OCEAN
Herschel Island
ALASKA
BRITISH MOUNTAINS
ARCTIC COASTAL PLAIN
ARCTIC PLATEAU
PORCUPINE PLATEAU
OLD CROW PLAIN
OLD CROW RANGE
Old Crow
Canyon
HILLS
LORD
DAVE
KEELE RGE.
Salmon Fork
BEAR CAVE VALLEY
OGILVIE MOUNTAINS
U.S.A.
CANADA
HILLS
NORTHERN OGILVIE RANGES
NAHONI RANGE
OGILVIE HILLS
TAIGA
SOUTHERN OGILVIE MOUNTAINS
YUKON R.
DAWSON
Klondike R.
YUKON PLATEAU
Stewart River
Mayo
Stewart R.
Elsa
Beaver R.
Stewart R.
Braine Pass
WERNECKE MOUNTAINS
MACKENZIE MOUNTAINS
Wind R.
Bonnet
Plume
Snake
River
RICHARDSON MOUNTAINS
McDougall Pass
Rat R.
Aklavik
DISTRICT OF MACKENZIE
MACKENZIE RIVER
Arctic Red River
ARCTIC CIRCLE
Fort McPherson
Stony Cr.
AMERADA-OHIO
Bell R.
BELL BASIN
EAGLE PLAIN NO. 1
Eagle R.
EAGLE PLAIN
CHANCE NO. 1
EMBANKMENT HILLS
Porcupine R.
Ogilvie R.
PEEL VALLEY
PEEL PLATEAU
NORTHWEST TERRITORIES
YUKON TERRITORY
BONNET PLUME BASIN
CENTRAL OGILVIE VALLEY
Hart R.
OGILVIE RANGES
MAIN RAGE
Blow R.
Babbage R.
Firth R.
65
140
135
GSC

Physiography and Resources of the Northern Yukon[1]

by H. S. BOSTOCK

Photographs by the R.C.A.F.

THE southern Yukon Territory developed in a bound after the Klondike gold was discovered in 1896, far ahead of other northern districts. Transportation by railway, steamboat and stage coach; government with an elected territorial council and representation in Parliament; telegraph and postal service; banks, theatres, saloons and all the modern trappings of that day were showered upon it. In contrast, the northern quarter of the Territory from forty miles north of Dawson to the Arctic Ocean remained almost untouched for an additional fifty years and more, until the idea that it might contain oil brought attention to it.

The northern Yukon is a roughly triangular region of about 50,000 square miles lying north of latitude 64°30′ north, following approximately the divide between the main basin of Yukon River drainage and Mackenzie River drainage. Alaska bounds the region on the west along longitude 141° west, the Arctic Ocean on the north and the District of Mackenzie on the east.

The map of the Yukon published by the Geological Survey of Canada in 1906 shows the region north of the Yukon-Mackenzie divide as nearly blank. The Arctic coast-line and the river routes travelled by W. Ogilvie and R. G. McConnell in 1888 and by C. Camsell in 1905, along with a few other streams, constitute the only information on it. The twenty-mile map of the territory published by the Department of the Interior in 1929 shows little more. Details along the Alaska Boundary, the survey of the Firth River and the assumed courses of some more rivers had been added.

The 1936 edition was virtually the same. Not until the mid 40's did new information begin to accumulate for this region, first from random air photographs, later from systematic modern photo coverage. The 1950 edition of the Yukon map shows the greater part of the drainage but has large areas blank, notably in the Ogilvie Mountains. It is only now that the compilation of standard maps on a scale of 1:250,000, with 500-foot contour lines, is being completed.

Looking at the region, now covered by air photographs, air photo mosaics, triangulation control and contour maps, some perspective of its general form can be gained. Taken as a whole, it is a basin floored by broad plains and low hills and rimmed by mountains. The rim is broken in places by broad gaps and is overthickened elsewhere, notably in the south, by wave upon wave of mountains.

The rim of the basin is formed by the Mackenzie, Wernecke and Ogilvie Mountains on the south and southwest; the Keele and Old Crow Ranges on the west; the British Mountains on the north and the Richardson Mountains on the east. Important gaps occur between the Mackenzie and Richardson Mountains and between the Richardson and British Mountains; minor ones between the ranges on the west side, where the rim is generally lower. Beyond the rim, the Arctic Plateau and Coastal Plain carry the northern edge down to the ocean and a fringe of the Peel Plateau fills in the eastern border of the triangle.

The main feature of the interior of the basin is the Porcupine Plateau, which includes the foothill ridges of the surrounding mountains and the hollows and ridges of the central floor in which the chief subdivisions are the Old Crow and Eagle Plains and the Dave Lord Hills that stand between them.

The overthickened part of the basin rim is the great barrier of mountains in the south, composed of the Mackenzie and Wernecke Mountains and the Southern Ogilvie Ranges. The ranges of these mountains form compact blocks of peaks and ridges separated by a network of big valleys. Their eastern summits reach more than 8,500 feet in elevation but they decline westward, only a few peaks in the Southern Ogilvie Ranges being more than 7,000 feet high. The lower passes are 3,000 to 4,000 feet in elevation. The timber line is

[1]Published with the permission of the Director, Geological Survey of Canada

reached at about 4,000 feet on the south of the divide but is at least 1,000 feet lower on the northern side.

North of the Southern Ogilvie Ranges three large, nearly parallel, east-west valleys lie in, or partly in, the Ogilvie Mountains. These are the Taiga Valley, the Ogilvie Valley farther north and west and the Peel Valley to the northeast, between the Ogilvie Mountains and the Eagle Plain.

The Taiga Valley is irregular in plan, resembling a dachshund looking westward. Overall it is about 120 miles long and in places nearly 40 miles wide. Its surface is largely long, undulating, northward-draining slopes and hills covered by tundra and niggerheads[2], with willow brush, small spruce and birch scattered and in groups in the better drained parts. Hedge-like stands of larger spruces and poplars grow on the more deeply thawed ground along the larger streams. Horses have been used by surveyors and hunters to this valley but seldom farther north due to the increasing scarcity of grasses. The Blackstone and Hart Rivers flow across it and into the Central Ogilvie Ranges to the north, regardless of the general conformation of the topography around them.

The general aspect of the Ogilvie Valley is similar to that of the Taiga Valley but the Ogilvie River, after gathering its tributaries in the Ogilvie Valley, breaks southeastward out of it only to return within a few miles and leave it again on the north side to cut through the ranges into the Peel Valley. In doing this it follows a fantastic course of meanders, in places entrenched nearly 2,000 feet.

The Peel Valley is a long trough. In its western part, the waters of the Ogilvie and Blackstone Rivers unite to form the Peel River and flow eastward gathering those of the Hart, Wind, Bonnet Plume and Snake Rivers before they turn north past the south end of Richardson Mountains. Along the northern side, the divide with the Porcupine and Eagle Rivers is only a few miles distant and in the west part actually overlooks the valley.

The Central Ogilvie Ranges lie between the Taiga and Peel Valleys and trend east-west. Except in the northwest where they are a compact mass of mountains reaching about 5,000 feet in elevation, they are composed of long, narrow, single or paired ridges separated by wide valleys. Some of them are hairpin-like and others elliptical in plan revealing a series of anticlinal and dome structures in their rocks.

North of the Ogilvie River, which forms the general boundary of the Central Ogilvie Ranges, the Northern Ogilvie Ranges rise in a series of north-south ridges. Here, in contrast to the central ranges, the summits outline broad synclinal structures in the strata. Nahoni Range is the only truly rugged and mountainous part of these northern ranges. Its peaks reach about 6,000 feet in elevation. The remaining areas are composed of ridges of rocky hills trending north-south, seldom more than 4,000 feet in elevation, separated by broad, taiga-floored valleys that widen northward.

East of the Northern Ogilvie Ranges are the Embankment Hills, a series of long, concentrically-curving ridges of hard upturned strata that dip easterly under the Eagle Plain. The ridges are remarkably continuous and even on top. Some are unbroken for more than ten miles and stand 700 to 1,000 feet above the adjacent valleys. Those formed of conglomerate have broad, bare, gravelly summits resembling vast railway embankments.

Continuing northward along the basin rim, the ridges of the northern Ogilvies dip gradually into Bear Cave Valley. This broad irregular hollow cuts across the structural trend and is pagoda-like in plan, with its top pointing northwestward to open into the Salmon Fork River valley which crosses the International Boundary following a conspicuous northeasterly lineament. North of Bear Cave Valley, the ridges rise again to form a wide area of hills and broad valleys among which the Dave Lord Hills are the highest and their summits reach 4,500 feet. These hills trend southeast towards the northern Richardson Mountains and separate the Eagle Plain from the Old Crow Plain and its satellite hollows along the Porcupine River. Beyond the Salmon Fork River, the Keele Range, a small area of high plateau, also trends northeast and reaches elevations of about 4,000 feet. From this range the land surface slopes northward in undulating hills to the Porcupine River which is entrenched in a canyon about 400

[2]"Niggerheads" or "Têtes de femmes" of some early explorers, are clumps of vegetation, generally "Arctic Cotton" about twelve inches in diameter at the top and narrower below standing a few inches apart in bog or a foot or so of water. When trodden on they bend over but they are firm enough that each one must be stepped over or around. Walking through them is exhausting and one mile per hour is a good speed.

View south looking up the valley of Bonnet Plume River as it flows from the mountains into the Bonnet Plume Basin, the border of which shows on the right (west). Note, that while the main valleys show the effects of glacial erosion distinctly, the influence of glaciation is almost absent in the low ranges in the immediate foreground.

feet below it, and sweeps up to the rounded summits of the Old Crow Range.

North of the Old Crow Range the surface drops gently to the Old Crow Plain and rises beyond it to broad undulating hills that form part of the plateau areas that here border the south side of the British Mountains.

The British Mountains are a compact group of concentric mountain ridges, trending northwest at their eastern end and nearly west at the International Boundary. The highest summits reach elevations of more than 5,500 feet and the valleys between them are so deep that the relief in many places reaches 4,000 feet. Many streams have cut courses radially across the ridges, and the valley of the largest, Firth River, completely traverses these mountains.

To the north, the British Mountains drop from ridge to ridge to the Arctic Plateau and then to the Arctic Coastal Plain. West of Herschel Island the Arctic Coastal Plain is composed of large alluvial fans and deltas formed by streams coming from the mountains. To the east of the island the Arctic Coastal Plain changes in character and has a pitted, lake-dotted topography of glacial origin. Its general surface rises gradually southeastward until it overlooks the Mackenzie Delta from a scarp about 500 feet high.

The Arctic Plateau extends eastward from the British Mountains to the north end of the Richardson Mountains and spreads southward between these mountain ranges. Its broad, rolling, sparsely-hill-studded surface rises inland and fuses with that of the Porcupine Plateau. Many of its hills are flat-topped and some form long, sinuous questas extending along the outcrops of harder strata in the open folds of the bedrock. The Barn Range is isolated, compact area of hills, much rougher in topography but not much higher than some of the more solitary hills of the plateau around it. The surface of the plateau is covered with niggerheads standing in the water and shines like a lake in oblique air photographs taken towards the sun.

The Richardson Mountains form most of the east rim of the basin. Their highest part, reaching 5,500 feet in elevation, stands astride

McDougall Pass (elevation 1,050 feet), the lowest gap in them. On the north of the pass they are a compact mass of rough, north-south trending summits but they decline northward into spreading finger-like ridges that gradually disappear under the surface of the Arctic Plateau. South of McDougall Pass the mountains become lower and narrow into two or three north-south round-topped ridges about 3,500 feet in elevation. At the southern end the trend of the ridges bends gently eastward splaying out like a partly opened fan until they are abruptly cut off at the Peel Valley.

Turning now to the features of the interior of the basin, those of chief interest are the Old Crow and Eagle Plains. The Old Crow Plain is remarkably level. Its central part, about 1,200 square miles in area, is a broad, lake-and-pond-spotted plain about 900 feet in elevation, except for one hill that reaches 1,000 feet. From the central area the land slopes gently up to the 1,500-foot contour at the base of the hills around it. On most sides, the slopes are two to six miles long but on the northeast and east they stretch for ten to twenty miles and their smoothness is marred by a few wide hollows and swells, some of which reach 1,500 feet. The whole plain is covered by tundra vegetation and is open except for spruce, birch and tamarack trees, very thinly scattered or in groups where some slight steepening of the slope, or a stream, improves the drainage and thawing.

In the central area, the ponds and lakes tend to be rectangular or formed of adjacent or overlapping large and small rectangles. Actually, their sides are not straight but gently curving, and the corners are rounded. Some lakes are nearly long isosceles triangles, or parts of such figures, with their apexes to the southeast or northwest. Some appear to be enlarging their areas, others appear to be filling in and becoming overgrown with vegetation. Zones relatively free of lakes and ponds border the larger streams but smaller streams flow from lake to lake through ponds and, gathering size, make their way into the larger streams. The soil along the streams and shores of the lakes and ponds is decaying vegetation, which forms banks ten to twenty feet high along the shores of some of the larger lakes. Old Crow River and its main tributaries meander elaborately in valleys entrenched sixty to 200 feet below the general level of the lakes. Their cutbanks expose silts with a layer tens of feet thick over them of the vegetable material that forms the soil of the plain. The orientation of the lakes and ponds is believed to be associated with the prevailing winds of summer.

The Eagle Plain on which the drilling for oil is in progress is like a tray with low rounded edges. It is about 110 miles long north and south and sixty miles wide east and west. Its surface is very gently tilted downward to the north where the Bell Basin fills its lowest part. Its major south-central, higher part is dissected by branching streams that have entrenched their valleys in spreading, tree-like patterns extending back from the north flowing Porcupine and Eagle Rivers but near the margins of the plain, where elevations are higher, the streams run towards the interior except for detours here and there around ridges of resistant, tilted strata. The interstream divides are long, even-topped, connected ridges with broad, gently rounded summits that drop with steepening slopes to the valley floors. The relief of the valley sides reaches a maximum of about 900 feet in the south where some ridges are more than 2,500 feet in elevation and declines northward to less than 100 feet in the Bell Basin much of which is below the 1,000 foot contour.

The Wernecke and southern Ogilvie Mountains are a part of the "second wet belt" that extends northwestward from British Columbia. In the Pleistocene Epoch, too, they received a relatively high precipitation and were largely covered by ice that was thickest in their higher, eastern parts and thinned to westward, all signs disappearing before the Alaska boundary is approached. North of these mountains the region was more arid and devoid of ice except along its borders to the southeast, east, and northeast, and perhaps in a few, small isolated localities in the highest ranges. From Wernecke Mountains the ice moved northwestward, across and up Peel Valley, past Hart River and overflowed a few miles into the lower passes to Eagle River. On the east of Richardson Mountains the ice moved northwestward from Mackenzie Valley and was deflected northward along the east slope of these mountains, only pene-

trating them where it thrust a long tongue through McDougall Pass into the Bell River valley. On reaching the Arctic Ocean it spread northwestward along the coast as far as Herschel Island. This general lack of glaciation gives the Yukon, and particularly the northern part, a unique, topographical character as far as the mainland of Canada is concerned.

The late Precambrian strata in the Wernecke and Ogilvie Mountains and along the International Boundary contain beds of low grade iron formation that may someday yield commercial iron deposits but so far prospecting has found nothing of interest. Placer gold has long been known in some streams flowing north from the British Mountains and in tributaries of the Babbage and Blow Rivers but the difficulties of prospecting for placer in this area are greater than farther south and little work has been done to evaluate them. Near the Barn Range, tungsten minerals occur with the placer gold and both metals have been discovered in lode veins near a granitic stock. In the late 1940's a bulldozer on a barge was floated down the Mackenzie River and landed on the coast several miles west of Blow River, driven fifty miles inland, and used in exploring these prospects.

In the Wernecke Mountains and Southern Ogilvie Ranges a large number of scattered mineral discoveries have been reported.

View south from over the south end of Richardson Mountains. The foreground shows to the junctions of the Wind River (right centre) and Bonnet Plume River (left edge) with Peel River which enters from the west (right) through its deep narrow upper canyon that appears here as a dark line. In the distance the Mackenzie (left) and Ogilvie (right, with cloud cover) Mountains lie along the horizon.

Placer gold was found in some neighbouring streams on Wind River by men on their way to the Klondike, but no profitable workings have been reported. Since then, particularly in the 1920's, after the successful mining of the silver-lead veins on Keno and Galena Hills showed that other metals than gold could be mined profitably in the Yukon, prospectors have explored these mountains from the Mayo area. They found them an endless sea of high ridges and drift-filled valleys, with no navigable streams and little timber, not even willows in the higher valleys and most of the passes. These men brought back specimens containing gold, silver, lead, zinc and antimony and reported discoveries of iron and copper, iceland spar and quartz crystals. Among their stories was one of the "greenstone country beyond the Snake" where chalcopyrite could be panned in the streams. This story was belittled by the belief that the area was underlain by sedimentary rocks. However, recent explorations indicate huge basic sills in the "country beyond the Snake". There were tales too of "lost mines", of a spectacularly rich gold vein somewhere on the tributaries of the upper Peel River, and of a fabulously rich vein of tin ore along the Eagle River. These yarns inspired expeditions to find them but the wilderness still holds the secret of whether they ever existed.

The geology of the region, with thick sections of openly folded marine Palaeozoic and Mesozoic strata, overlain in some areas by non-marine Mesozoic and Tertiary strata suggests that the main resources will be fuels, petroleum and coal.

A small coal mine in possibly Jurassic strata on the edge of the Mackenzie Delta just inside the District of Mackenzie has been operated from time to time. The mine workings are in permafrost and hence, though the hanging wall rocks are soft, no timber is needed to support it. Coal seams of Mesozoic age have been reported at the head of Blow River and along Peel River. Coal or lignite of Tertiary age has been found near Old Crow and in the Bonnet Plume Basin where a seam has been burning since 1893.

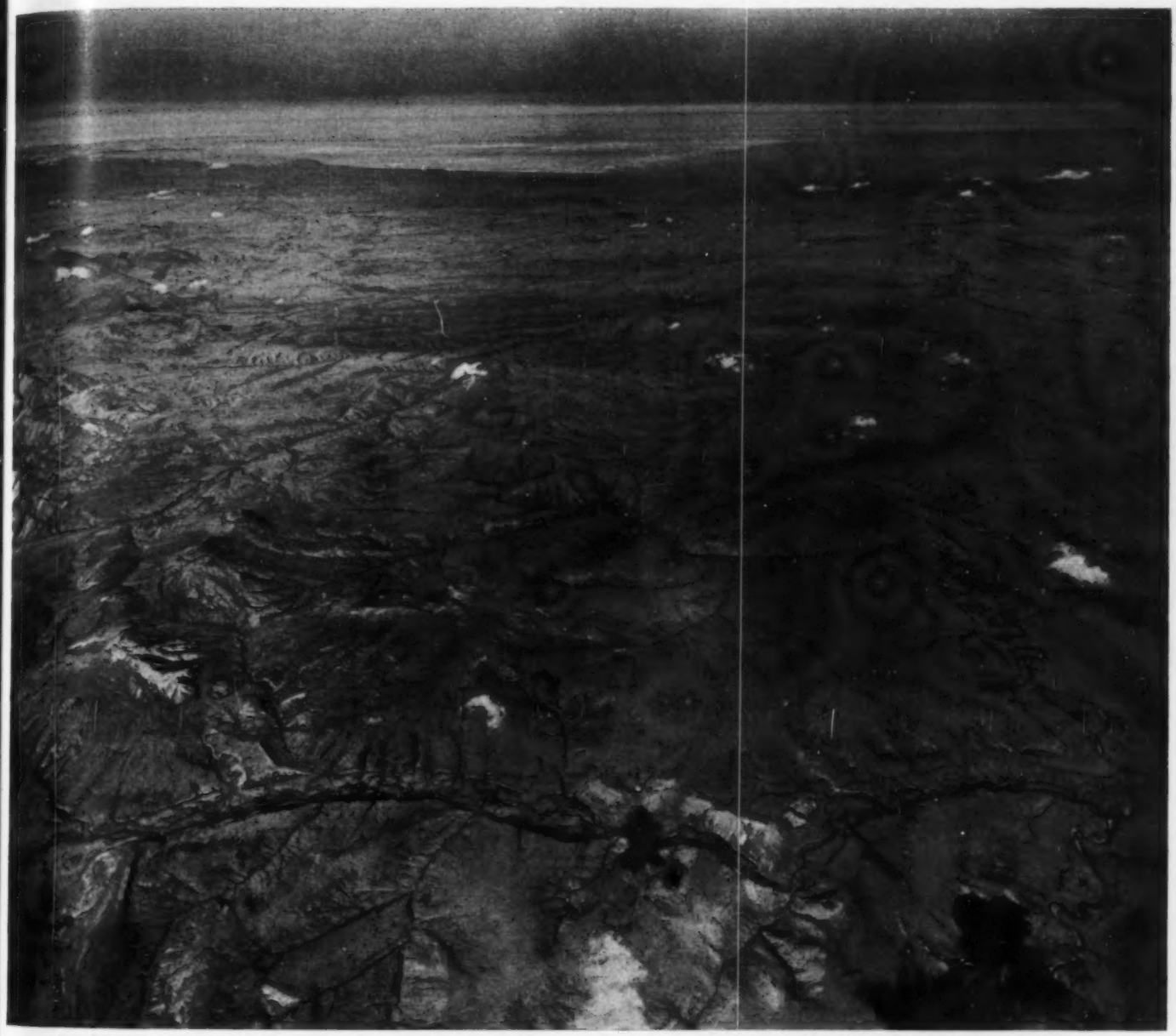
The first suggestion of oil was reported by Camsell when he found bitumen veins and petroliferous shale along the Peel River below Wind River and later when bitumen was found near the eastern headwaters of Babbage River. However, until 1950, there was no interest in the possibilities of oil and gas in the northern Yukon and even in the last war, during the Canol project, little attention was paid to this region. It was regarded as too far from Norman Wells and the Canol pipe line to be of economic interest.

The remains of Pleistocene mammals, including ivory, are found in many northern regions, particularly the unglaciated parts of North America and Siberia. Indeed, some writers have said that, about the beginning of the century, more ivory was exported each year from Russia than from Africa. In accord with this, placer workings in the Yukon and Alaska have also yielded the skeletons and bones of mammoths, mastodons, camels, horses and buffaloes, some even preserved in the flesh by the permafrost. The explorers in the northern Yukon from the early days have remarked on the tusks seen there, and the Indians are reported as saying that the course of the Old Crow River was the best locality in Alaska and the Yukon to find them. Certainly the geological setting of the Old Crow Plain with its recent subsidence and unglaciated character suggests that it should be[3].

The Old Crow Plain has another, less spectacular and more practical resource in fur. The average number of muskrat skins turned in at the Old Crow trading post each year from 1951 to 1954 was 29,000 and it is believed the greater part of these came from the ponds and lakes of the Old Crow Plain.

Another resource of this region might be hydro-electric power. The new topographical maps reveal some peculiar features of the drainage that may allow its development. The passes out of the Porcupine River drainage are at 1,300 feet elevation or higher, except for McDougall Pass at an elevation of 1,050 feet, and the bottom of the canyon of the Porcupine River at the International Boundary of about 755 feet. The canyon rims in Canada are as high as 1,200 feet but a few miles west in Alaska they are above 1,400 feet. A 300-foot-high dam in the Porcupine River canyon would create a lake of 2,500 or more square miles in area and divert the water of the Porcupine over McDougall Pass into the Rat River. Rat River drops down to

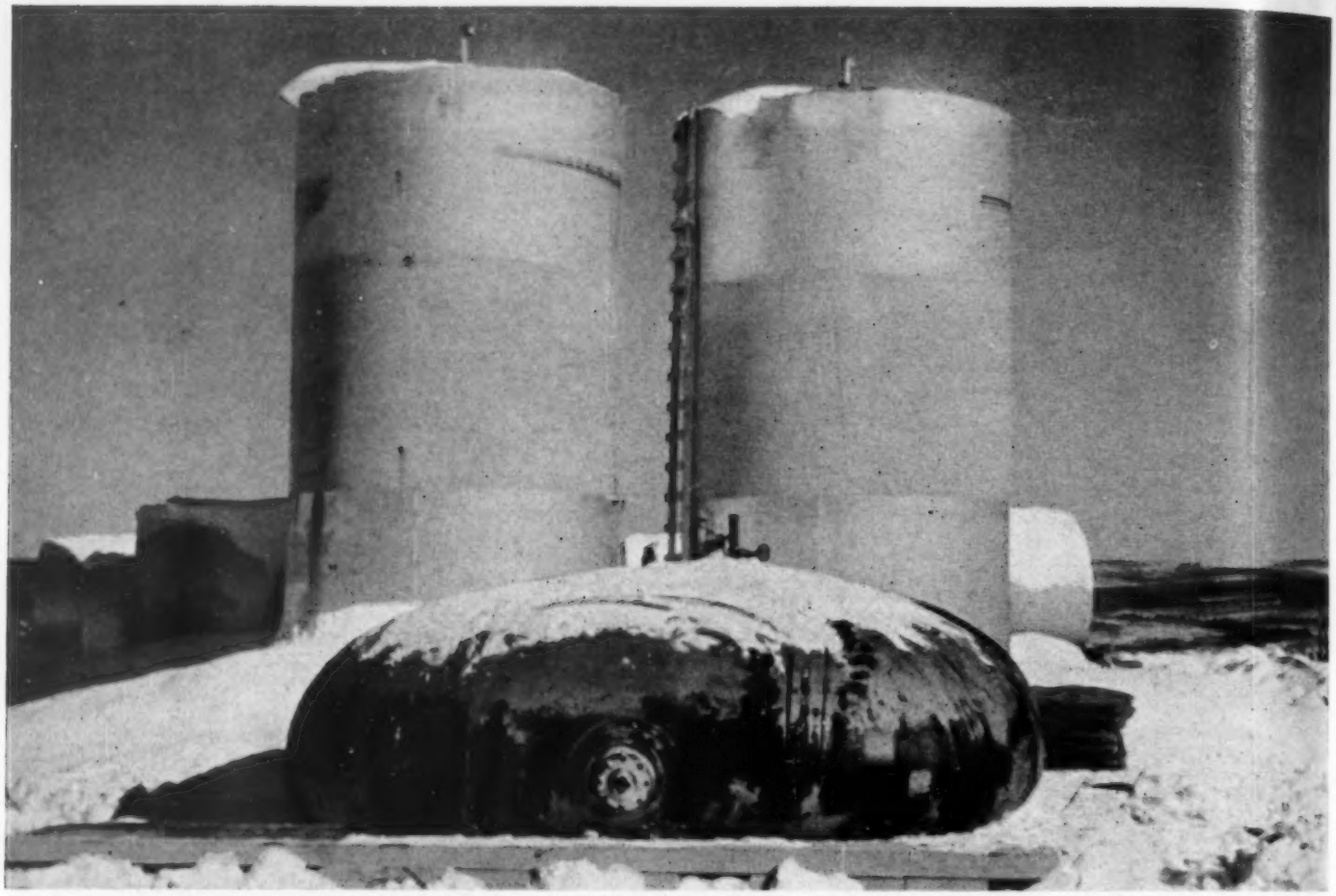
[3]All such remains belong to the Canadian Government and permits are required to look for and collect them.



View north from near the head of Blow River. In the foreground is the surface of the Arctic Plateau which merges into the Arctic Coastal Plain and beyond them the Arctic Ocean shows in the far distance. On the left (west) centre Mt. Fitton shows as a rocky hill and to the northwest of it the east part of Barn Range can be seen. Herschel Island shows as a line under the clouds over the ocean on the left.

the edge of Mackenzie Delta on a steep course through a crooked canyon-like valley and about 900 feet of head might be available to generate hydro-electric power.

With the coming of the bush pilot with his aeroplane and particularly the helicopter the northern Yukon passed into a new era of accessibility for the prospector and the surveyor. The muskeg still forms an insuperable barrier to the transport of heavy loads in summer but engineering technic has made the frozen tundra and snow in winter readily serviceable for the movement of the massive machines required for development. It merely awaits the need that will justify the inevitable high costs.



Diesel storage tanks: the rubber tank in the foreground recently tested successfully as an efficient and portable storage facility.

The Search for Oil in the Yukon Territory

by W. G. CAMPBELL

Photographs by the author

DURING the last decade, some fifteen to twenty millions of dollars have been invested directly in oil and gas exploratory activities in the Yukon Territory, most of this during the last four to five years. Sums of this magnitude are not invested without some knowledge of the country in which the investment is to be made and some definite goal or objective in view. In the case of the Yukon, the finding of commercial quantities of oil and gas was, and still is, the objective and was initiated in the belief that suitable geological and physical conditions which favoured the accumulation of liquid and gaseous hydrocarbons were present.

Prior to 1953, the year Conwest Exploration Company started geological surface parties into the Porcupine and Eagle River areas, very few, if any, white men had actually penetrated this part of the Yukon. It was therefore very much of a pioneering undertaking during those early days.

The Eagle Plains area of the Northern Yukon where most of the oil and gas exploration has been concentrated to date, straddles the Arctic Circle. It is 1,500 air miles north of Calgary, 500 miles from the port of Valdez on the Alaskan Coast, and only 200 miles from the Beaufort Sea. It is a region unmarked by recent ice ages and contains substantial thicknesses of sedimentary rocks. Gently rolling hills exhibiting 300 to 500-foot relief are predominant, covered for the most part with scrub growths of spruce and birch trees and blanketed with moss. The main drainage system consists of the Porcupine, Peel, Ogilvie, Eagle and Bell Rivers, which meander through the plateau area. The Peel and Ogilvie Rivers join and flow into the Arctic Ocean, whereas the other three join together and

flow into the Pacific Ocean via the Yukon River. Many small tributaries form a lacework of creeks and streams, along the banks of which heavy stands of spruce trees thrive and accentuate the flow patterns. Permafrost exists at varying depths almost everywhere beneath the surface, varying from only a few feet to over a thousand feet in depth. Climatic conditions are extreme, being very cold in winter with moderate snowfall and little wind, while summer temperatures can be very hot and are conducive to swarms of mosquitoes and black flies. Animal life, seemingly sparse at first, is actually quite bountiful and includes caribou, moose, bear, martin, wolverine, mountain sheep, and wolves. There are also many types of birds, the most noteworthy being the raven, which inhabit the country the year round.

To promote enthusiasm in the search for oil and gas in a particular area, certain basic criteria must be satisfied. Well-developed strata of sedimentary rock must be present, for it is believed that oil and gas originate in these strata. The rock must have porosity and permeability, to provide void space within which the hydrocarbons may have accumulated. It is necessary, also, that these rock strata be of a certain formation or structure, making possible the entrapment of oil and gas in static reservoirs. If these prerequisites are thought to exist, then the search is started to prove their presence, and if proven, the remaining requisite for a successful search — the presence of oil or gas — can be determined by drilling.

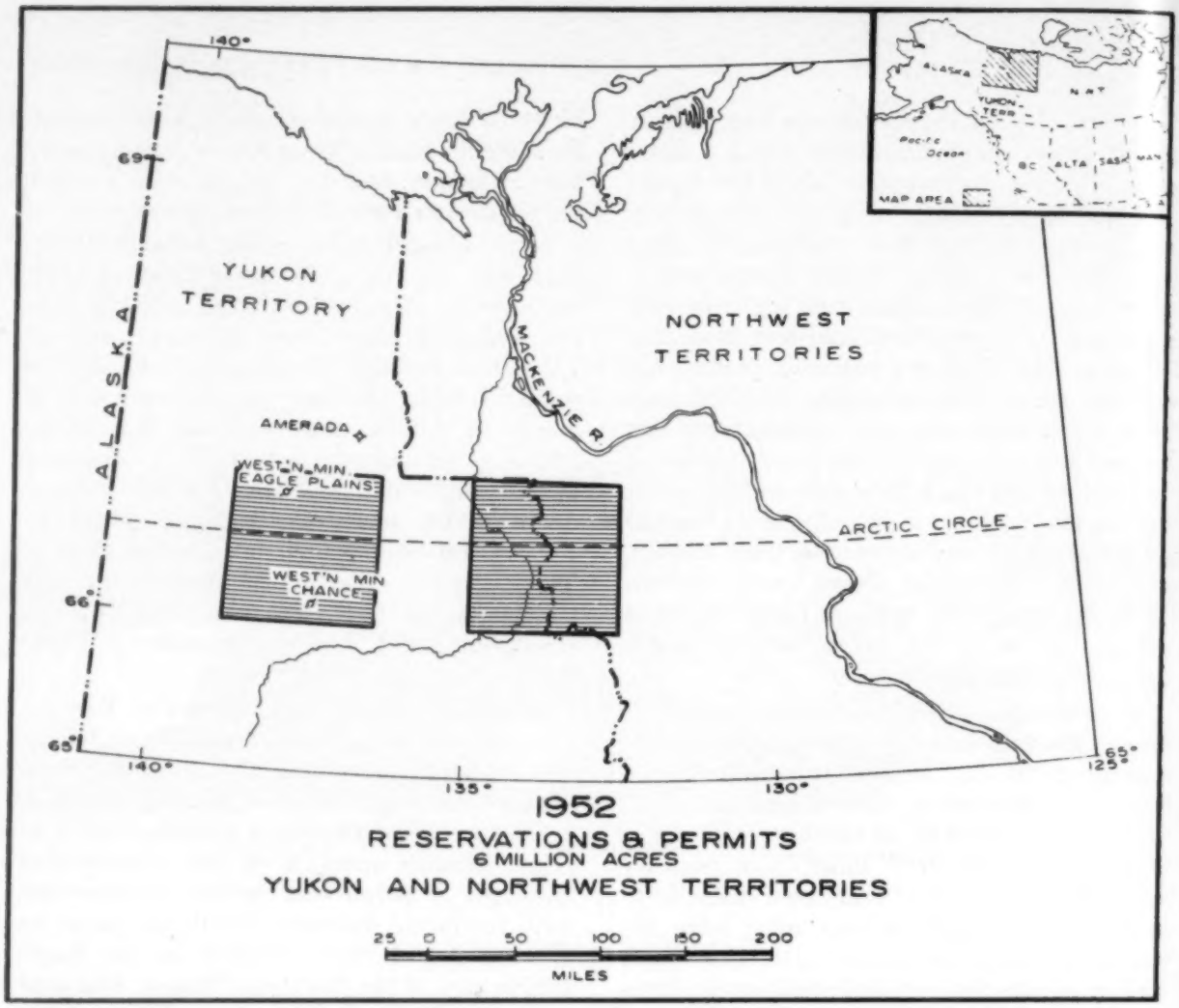
Generally, only that portion of the Yukon north of latitude 64° 30′ N. displays basic geologic structures which might contain large deposits of oil and gas. Vast basins of sedimentary rock have been known to exist in the Northern Yukon since the late eighteen hundreds and early nineteen hundreds. Reports of these deposits were first made by personnel of the Geological Survey of Canada. However, not until the late 1940's and early 1950's was it suspected to what extent the sediments were present. There were indications that these rock strata were very thick, which added a further attraction to the possibilities for oil and gas accumulation. Large reservoir structures requiring relatively low exploration and appraisal costs, are more likely to occur in regions of thick sediments. Reasonable finding costs are of major significance in any area but are of even greater importance in such an isolated place.

As additional information became available over the years, the possibilities of large sedimentary structures existing in the Northern Yukon became more apparent, and in 1952, the Federal Government offered for public tender, through the Department of Northern Affairs and National Resources, two large oil and gas exploration reservations of three million acres each. One was located north of 66 degrees latitude, west of the Richardson Mountains and in the Yukon Territory; the other at the same north latitude, east of the Richardson Mountains, straddling the Yukon and Northwest Territories boundary.

Conwest Exploration Company of Toronto was the successful bidder and immediately sent out surface geological and seismic parties. Eventually, Western Minerals Limited, a Calgary-based Canadian independent company, became operator of the venture and climaxed a seven-year period of appraisal with the initial discovery of oil and gas at its Chance No. 1 Well, located in the Eagle Plains area of the Northern Yukon. The year was 1959.

During this seven-year period, other companies became interested in the oil and gas possibilities of the North; 93 million acres of oil and gas permits were issued by the Federal Government of Canada in 1958 and 1959. Since 1959, some of the acreage has been dropped, 73 million acres remaining under permit or lease in the Yukon and Northwest Territories as of 1961.

The question has often been asked, "What will you do with the oil if you do find it?" Currently, the most important part of that question would appear to be "if you do find it". The showing of oil and gas at Chance No. 1 was, of course, encouraging, not only to Western Minerals Limited, but to other companies having interests in the country as well. It substantiated the belief that the three geological fundamentals required for hydrocarbon accumulation, mentioned previously, did exist; however, indications are that the extent of the reservoir is small and of no economic significance and, of course, the

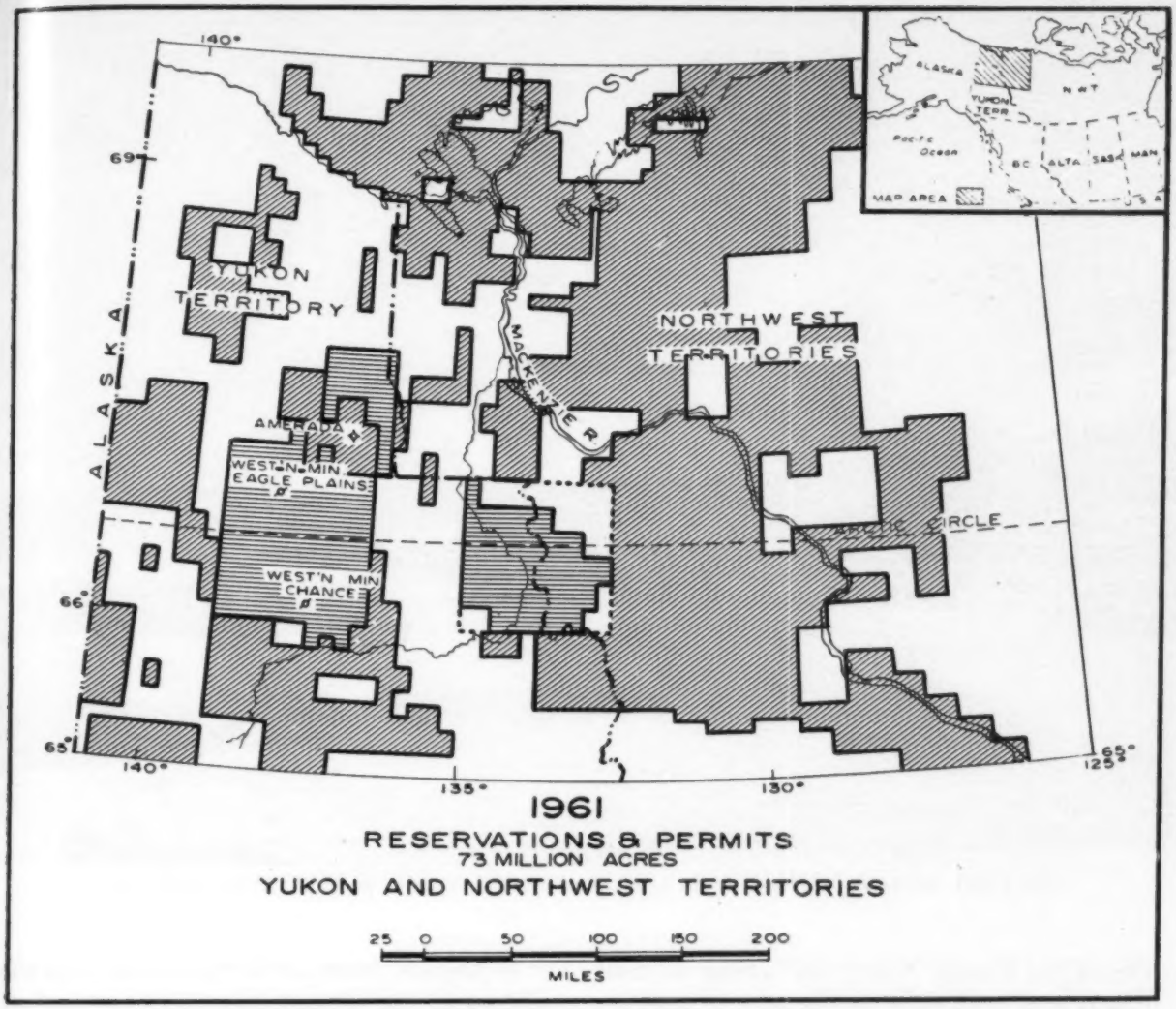


presence of other reservoirs still remains to be determined. Based on the recent rate of progress, it is anticipated that to appraise the Eagle Plains sector alone would take another ten to fifteen years exploration, costing many millions of dollars. This requires not only great faith in the oil and gas potentialities of the Yukon, but also in the marketability of reserves on a profitably competitive basis when they are sufficiently developed. Only oil is considered here but gas reserves could well be an important factor in the economic development of the Yukon, particularly if industry progresses in the rest of Northwestern Canada.

A look at the world globe may help to point out potential market areas. From the Eagle Plains region, it is 500 miles to the nearest seaport on the Pacific Coast; a pipeline 1/6 the length of the Interprovincial Pipe Line would reach it. From there, the cheapest method of transportation known — ocean tanker — could deliver to markets 1,500 miles away in the Northwest United States, and 4,000 miles to Japan and other Asiatic countries.

Another glance at the globe will show that only 200 miles of pipeline are required to reach the Arctic Coast. From this point it is only 4,000 miles to the United Kingdom and Central European countries. In comparison, Venezuela, an oil-exporting country, is 5,200 miles from the United Kingdom and 4,500 miles from the Western United States. The great oil producing countries of the Middle East have to transport their oil 4,000 miles to the United Kingdom and 5,800 miles to the Eastern United States.

A few years ago, navigation through Arctic ice packs and frozen channels was considered nearly impossible. However, today, with the advent of atomic ice-breakers, atomic submarines, and other scientific advances, the establishment of a real Northwest Passage



may be quite feasible. Carrying fantasy to the extreme, inter-continental freight-carrying guided missiles are under study.

The implication intended, of course, is that if oil is found in sufficient quantities in the Northern Yukon, it can be marketed on a world basis. Competition from other oil producing countries is assumed and a foregone conclusion. However, many believe that with efficient management and control, aided by realistic regulatory authority, oil can be produced competitively in the North. In addition, Canada offers a steady political climate which should enhance the guarantee of a continued supply for export on a reasonable and long-term basis.

Assuming that the market is available and reasonably easy to reach, it then is necessary to find enough oil to warrant the tremendous expenditures required to carry out initial exploration programs, develop potential reserves, and construct pipelines to carry the oil to seaports. The cost of making oil producible would include land acquisition, rentals, exploration costs of all kinds, capital investment in equipment, development costs, operating costs and a fair return on monies expended and must be competitive with the similar costs of other oil-producing countries. As a general observation, it would not be unreasonable to assume that at least one billion barrels of oil must be found and developed to ensure an economically feasible development.

What costs would be incurred in proving up one billion barrels of oil ? Let us look at the Province of Alberta. The most recent boom in oil and gas in this province was started with the discovery of oil in 1947 near the town of Leduc. At that time, the total oil reserves in the Province of Alberta amounted to some 200 million barrels, being made up almost entirely of the Turner Valley oil field. Governmental statistics show that 1,000 additional exploratory wells were drilled be-

Flat Creek, the base for tractor train operations, thirty-five miles south of Dawson City.

tween the Turney Valley and Leduc oil field discoveries with little in the way of reserves being added to the Provincial total. According to the Oil and Gas Conservation Board records, 400 additional wells were drilled in the years 1947 to 1949 inclusive before a cumulative recoverable virgin reserve figure of one billion barrels of oil was attained. A fair estimate of the cost of drilling these 1,400 wells plus the cost of land acquisition, rental costs, exploratory costs, and development costs, would be in the realm of $500,000,000.00, or in other words, finding and evaluating costs of 65¢ per barrel. Studies made by various groups in the oil and gas industry estimate the same costs per barrel of oil in Canada as ranging from 63¢ to $1.12. On the other hand, the finding and evaluating costs of oil in the Middle East are estimated as ½¢ per barrel, the principal reason for the wide difference in costs being in the reserves found per well drilled. For example, reserves per exploratory well drilled in Canada amount to approximately ¼ million barrels, whereas in the Middle East in Iraq, reserves per well approach ½ billion barrels.

In August, 1959, oil, for the first time in the history of the Yukon, flowed to the surface and that first barrel of oil had a price tag on it of many millions of dollars. This sum was expended over a period of eight years, involving the use of most of the techniques and tools normally employed by exploration companies in the process of searching for oil. Integration of photogeology, surface geology, gravimeter and magnetometer surveys, and seismic projects culminated in the drilling of two wells on Western Minerals' land. The second well, Western Minerals Chance No. 1 gave up promising flows of both oil and gas.

Other companies have also invested heavily in the Yukon, one of which drilled a deep test-well at approximately 67° 20′ north latitude, the most northerly well drilled in the Yukon to date. Many are conducting several other types of exploratory programs. These various activities represent not only large disbursements of money, but reflect considerable physical effort on the part of those undertaking them. The physical barriers which had to be overcome in the Northern Yukon were at times almost insurmountable,

Tractor train entering the North Klondike River Valley on its first stage over the Ogilvie Mountains.

particularly in those first few years when very little was known of the interior of this vast country.

Being a virgin land, not hitherto inhabited by man, separated from the nearest settlement and supply base (Dawson City) by the Ogilvie Mountains, the first and foremost obstacle to overcome in the carrying out of an exploration program was the transportation of men, equipment and supplies. The only positive useful information about the Eagle Plains area that was available in the beginning was the severity of the weather during the winter months. Knowing this, it was a logical decision that all major freighting should be undertaken in winter when the ground and rivers would be frozen sufficiently to withstand heavy loads. The success of this phase of the search for oil has been demonstrated yearly. A total of nearly seven thousand tons in all has been moved from Flat Creek, 35 miles south of Dawson City to the Eagle Plains section of the Yukon over the past five years. In 1957, a large drill rig, related equipment and supplies, representing some 2,600 tons was taken in by tractor train over a three-month period, and was the largest tonnage delivered by Western Minerals Limited in any one year.

The organization and operation of a freighting operation of this kind is in itself a major undertaking, requiring careful planning and diligent supervision. Comparatively speaking, costs are high, and this is reflected in the costs of some articles being doubled on delivery in the field. However, until such time as roads may be developed, freighting in the Northern Yukon will remain a costly enterprise and will be one of the major causes of the high cost of exploration.

Aircraft, both fixed wing and helicopter, are used extensively in the North for the transportation of personnel and supplies during all seasons, as well as providing the necessary field support for any endeavour undertaken in the search for oil and gas. It would be impossible to attempt surface geological work, seismic and gravimeter surveys without the use of aircraft and even drilling and tractor freighting must be supported by air services. Medium-sized aircraft can be chartered for eighty to one hundred dollars an hour, and heli-

copters, of the type used for geological and seismic programs, cost an average of one hundred dollars per hour to hire. These expenses are considered essential and form part of normal exploration costs in the North, but are not required in similar activities conducted on the plains of Western Canada.

There are difficulties other than freighting to overcome, all contributing to an abnormally high cost of exploration. Permafrost limits some operations to those seasons when frost gives sufficient bearing-strength to the surface of the ground. During the winter months, extremely cold weather and short daylight hours restrict, if they do not completely prohibit, many operations. Freighting overland is limited to the winter and drilling activities, though possible during the colder periods, are more efficiently conducted during the warmer months. Communications are dependent upon the Department of Transport facilities at Dawson City through radio telephone on licensed frequencies, which in itself is quite adequate. Radio transmission of messages is vulnerable however to local weather conditions and to cosmic storms emanating from sun spots. Complete "blackouts" do occur and have been known to last for several days.

Because of the isolated locations in which most of the work is done, personnel have to be dealt with on a special basis. It has been found unwise to keep men in the field for more than a few months at a time. There are only a few persons who normally, at the end of a certain period, do not show signs of becoming what is commonly described in the North as "bushed". That is, they become lethargic in their thinking and actions, normal everyday happenings become problematic, problems become insurmountable and nothing, not even success, gives satisfaction. People feel alone and ignored and the urge is strong to get back to the "outside". Prospective personnel must be screened and judged as suitable, special attention must be given to living quarters, board, and recreational facilities. Every reasonable step is taken to make the working man content and therefore efficient in this work.

A full-scale exploration program must follow a recognized sequence, starting with surface geological work followed by gravimeter and magnetometer surveys. Then, possibly, a seismic program is recommended and, finally, the undertaking of a major drilling operation. This sequence is likely to be followed several times as each different part of the prospect area is appraised. Each phase is carried out at different times of the year when climatic and other conditions are most suitable. Added to this, the results of initial programs must be analyzed and interpreted before the next stage can be decided upon. This takes up valuable time — often as not, weeks or months to finish.

Permafrost, already referred to, needs special mention because it is probably the most important single factor affecting field work. By definition, permafrost is that part of the sub-surface which is at all times below freezing. In the Yukon, during the summer months, the top two or three feet of silty soils and lenses of ice melts, and if the native moss, which completely blankets the ground, is disturbed, the surface becomes a veritable sea of watery silt and mud. Travel over it is practically impossible. Very little gravel is at hand and no readily available "fill" material is procurable. This situation virtually eliminates the practicability of making roads and airstrips for summer use, unless at great expense. Operations requiring ground transportation are therefore not undertaken during the summer months. New techniques and equipment are slowly overcoming the limitations set by melting permafrost, but the solutions are far from being completely successful.

Permafrost also affects drilling operations as it limits the movement of freight to supply the operation to winter months, prevents a rig move during the summer months, and requires special techniques, not only for setting up the rig, but also in drilling the hole. Placing wooden piles beneath the sub-structure of a rig is necessary if drilling is to be extended into the warm season. The melting surface provides a very unstable base for the rig to stand on and it will topple if piles are not used.

Wooden piles ten inches in diameter and twenty feet long are placed beneath the rig sub-structure, with many more of slightly less size placed beneath the mud pumps, tanks, tool-houses, and steam-boilers. The holes for these piles are drilled with air, the piles then

Drilling with a seismic drill in melted permafrost.

The bombardier, used for transporting personnel and supplies, requires tracks to traverse the melting permafrost.

Drilling and setting piles for a rig platform. Steel capped piles with connecting timbers are on the right.

The first quart of oil ever produced in the Yukon, at Chance No. 1, held by W. F. Wuest, company geologist.

lowered into the dry hole. Water and mud are then poured around the pile in the hole and allowed to freeze. This procedure has proved to be very effective in establishing a firm base for any drill-rig.

In drilling the deep hole itself through the permafrost, the use of conventional drilling-mud systems can prove inadequate. The warm drilling-mud can quickly melt out the silty overburden and ice lenses producing large and sometimes uncontrollable cavities and with it, lost circulation conditions. If the unconsolidated materials at the surface are substantial, then a protective casing is required to whatever depth is necessary to supply adequate protection. This large diameter surface hole is best drilled with air, which reduces effectively the danger of major sloughing usually encountered when normal drilling fluids are used. The hole is drilled deep enough to penetrate the first layer of consolidated rock, which may vary from thirty to several hundred feet down.

Permafrost does not seem to present or cause any abnormal difficulties when the cementing of the casing is undertaken. Actually,

the temperature of the permafrost is only a few degrees below freezing, at any place or at any depth, and does not prevent the cement, used in anchoring the casing, from setting-up normally. Fortunately, bed-rock is quite shallow in the Eagle Plains area and the heat generated by the setting cement does not cause hole deterioration except at the surface where the overburden is less substantial.

This and other special operating techniques which are necessary in any portion of an exploratory undertaking, plus the overcoming of physical aspects, of which mention has already been made, do add considerably to the costs of the initial stages in the search for oil in the Yukon. In drilling, because of the special precautions, services, and heavy inventories required, the costs of an exploratory deep test well can readily reach a million and one-half to two million dollars and take up to two years to complete.

In summary, then, oil and gas exploration has been, and is presently being, successfully undertaken in the Northern Yukon Territory, but with more difficulty, and therefore at a greater expense, than comparative operations conducted on the plains of Western Canada. The economic incentive is considered on a long term basis with initial investment being great, but with a reasonable expectation that oil and gas will be developed in sufficient reserves to result eventually in exploratory and development costs being at least competitive with, if not less than, other oil-producing countries. It is not anticipated that this point will be reached, even assuming the reserves are there to be found, for many years. A quick return on initial investments made is not one of the attractions of the Yukon. In fact, the initial high cost of oil and gas exploration, plus some hesitancy in accepting present regulatory policies has, for the time being at least, reduced the interest. Regions of immediate potentialities are receiving most of the attention from exploration companies today.

The concensus of opinion, however, of most companies is one of reasonable optimism with respect to the orderly and economic development of oil and gas in the Yukon and the North as a whole. New techniques and equipment are reducing costs year by year and the ingenuity of man to meet seemingly unsolvable situations will be seen again meeting the challenge of this isolated land. Many new applications of atomic power, electronics, and other scientific achievements are already waiting to be used beneficially. Oil is now in over-supply in world markets, but men eminently qualified to give an opinion have predicted that present consumption and future demands will increase steadily. In basing their conclusions on known world reserves, they represent them as being "alarmingly inadequate". It would therefore seem quite reasonable to conclude that although the stakes are high in the search for oil and gas in the Yukon, that there is a reasonable and fair chance that the rewards will be great and long lasting.

Eagle Plains terrain, April, 1958, showing typical stream meanderings and considerable tree coverage.

The rugged grandeur of the Khyber Pass, an imposing setting for historical adventure.

Khyber: The Pass of Destiny

by A. B. RAJPUT

Photographs by the author except where credited

FEW PLACES in the world have shaped the destinies of nations and changed the course of history through the long span of nearly 5,000 years like the Khyber Pass in Asia. Situated between the present States of Pakistan and Afghanistan in the Sufaid Koh range of the towering Hindu Kush mountains, this thirty-three-mile long defile provides the vital road-link between Peshawar and Kabul and the Central Asian areas beyond. Like the Daryal Pass in the Caucasus, or the Great St. Bernard and St. Gotthard passes in the Alps, the Khyber has always had great strategic and economic importance. The history of the Indian sub-continent has been influenced by the success or failure of the dynasty defending it.

Opening up about eighteen miles west of the ancient city of Peshawar in Pakistan, the Pass is guarded by the mud fort of Jamrud which also serves as a toll-gate for caravans and convoys. The Pass is not merely a valley between mountains but is a narrow defile rising to over 3,500 feet in height and falling steeply thereafter. Two metalled roads—one above the other—have been constructed laboriously through it; the lower one for motor-cars and vehicles and the upper one for

camel caravans and sheep and goat herds. A railroad has also been constructed up to the Afghan Frontier and has been operating since 1925. Passenger and cargo vehicles looking amazingly bright and colourful against slate grey mountains, ply freely today up and down these roads, where once marauding tribesmen would ambush travellers and collect tolls from passing caravans.

Today with the gradual development of a spirit of friendliness and cooperation between the tribesmen and Government, only a small force of *Khasadars* is maintained to police the area. The Kasadari is a force of local militia consisting of 1,681 men from the tribesmen themselves who guard some 130 posts and pickets along the Khyber Pass and the adjoining plain, by equipping themselves with their own rifles, ammunition and uniforms. They escort caravans through the Pass, protect the flanks of the Khyber Road at certain exposed points, and help guard the western borders of the Peshawar district from Warsak to Aimal Chabutra. They also help the authorities to detect goods and animals smuggled into the Pass from the tribal area. The salary of a Khasadar is about ten Canadian dollars a month which is considered quite handsome payment by these simple folk with few needs.

The area along the Khyber Pass, officially known as the Khyber Agency, is inhabited by various tribes known as the Afridis, Shinwaris, Shilmanis and Mullagoris. Among these, the Afridi tribe is by far the largest in number, comprising nearly 195,000 out of the total tribal population of 215,000 in the Agency. They live mostly along the Khyber Pass and the adjoining Khajuri Plain.

These independent tribesmen who were a constant source of trouble to the British entered into an agreement with the Pakistan Government after Independence in 1947, by which they agreed to remain peaceful and law-abiding citizens of Pakistan and to render every assistance whenever called upon to do so. As a result of this change of attitude their economic condition have improved considerably; new avenues have been opened for them in various trades and professions; and the basic amenities of modern life—schools, hospitals, maternity centres and industrial homes are being set up in the tribal area

One of the numerous camel caravans makes its way down the pass from Afghanistan.

hitherto completely cut off from the light of modern progress. The famous Islamia College in Peshawar has been raised to the level of a university where special facilities for studies, boarding and lodging are provided to the sons of these hardy people who are given handsome stipends and scholarships by the Government.

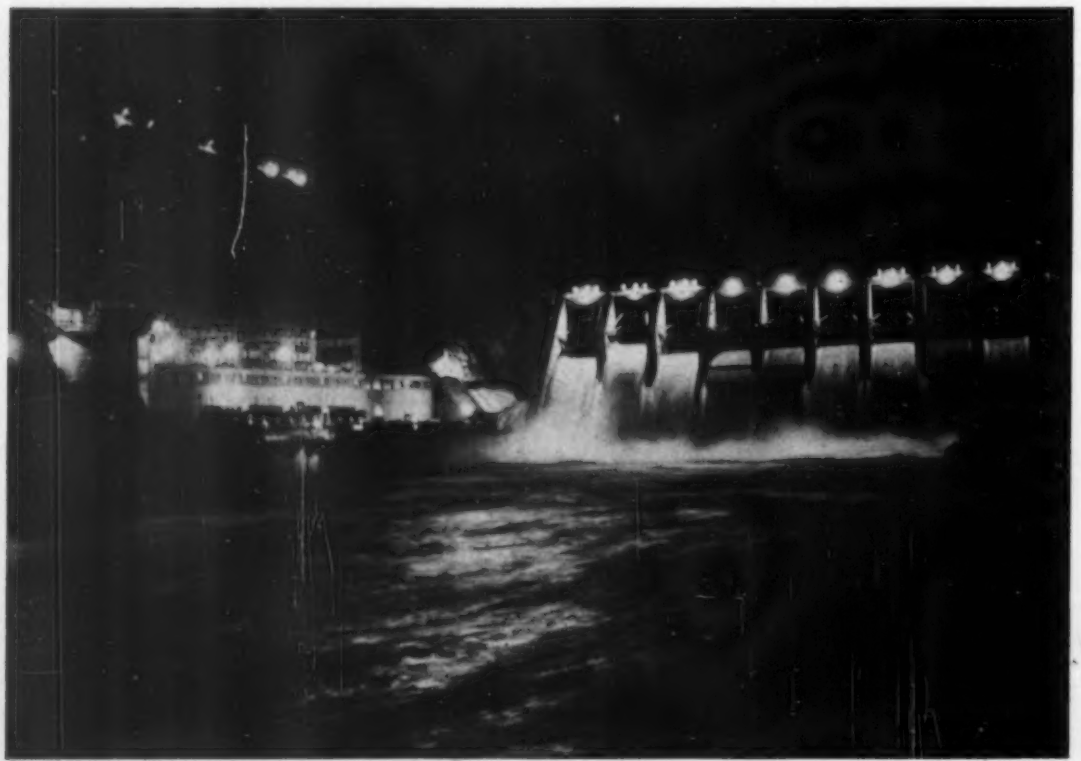
Of all the development schemes that have so far come up in the Khyber Agency, the 61-million-dollar Warsak Multi-purpose Hydro-Electric Project is decidedly the biggest and most far-reaching in effect undertaken by Pakistan with the assistance of the Canadian Government under the Colombo Plan. The Project, which has recently been completed, is one of Canada's major contributions towards the economic development in South and South-East Asia. The importance of Warsak Project can be gauged by the fact that out of the total sum of 115.85 million dollars given so far to Pakistan by Canada under the Colombo Plan, over 36.62 million dollars have been allocated alone for this Project. This amount covers the cost of machinery and equipment in addition to the wages of Canadian engineers and technical experts provided by the Government of Canada.

The Project is located on the Kabul river in the tribal territory, about eighteen miles away from the mouth of the Khyber Pass on the Peshawar side. Construction work on the Project was started in early 1956, and after four years of laborious and often quite risky work by 150 Canadian and 400 Pakistani engineers, assisted by some 8,000 tribal labourers, the first phase of the programme at Warsak was completed in June 1960.

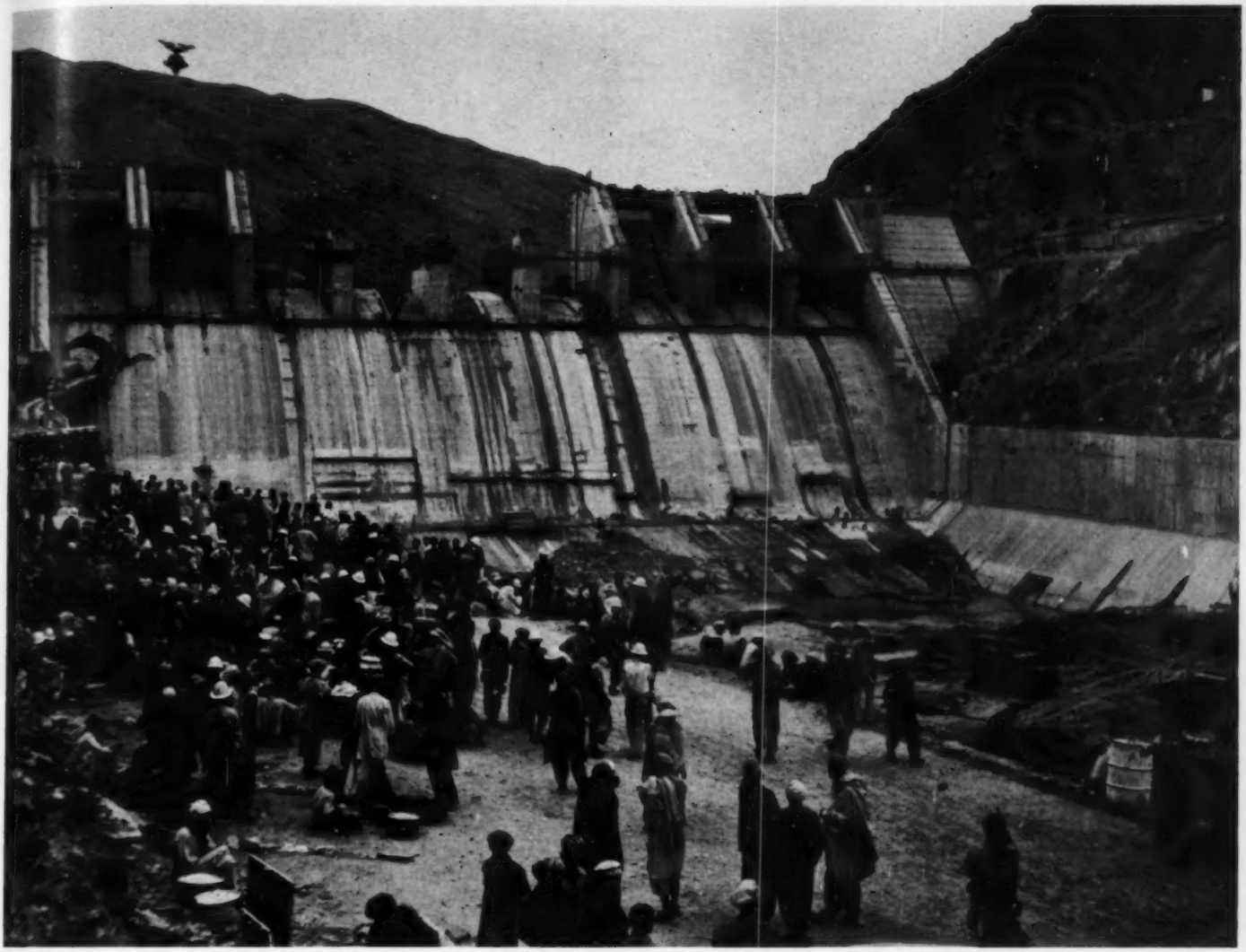
With the completion of the first phase, the Warsak Project is going to serve a dual purpose: to provide irrigation to nearly 121,000 acres of land, mostly belonging to the tribesmen and to supply power to a wider area of the West Pakistan Province. The power house constructed near the dam is currently providing 160,000 K.W. of electric energy through four generating sets, but ultimately two more generators of 40,000 K.W. each will go into operation to provide a total 240,000 K.W. of electricity.

The most interesting aspect of Warsak is that while the Project may still take some time to change the face and economy of the tribal territory, it has already revolutionized the outlook of the tribesmen who are fiercely independent and were accustomed to rely on their rifles alone for a precarious living. Today one comes across along the dam-site hundreds of these people dressed in overalls, steel helmets and gumboots, learning skilled trades and handling heavy machinery. They are proud to see that the Project is coming up in their territory, for their own good and for the larger benefit of their children and dependents.

But the Khyber still has a ring of mystery around it. Indeed, from the foot of the bleak,



The recently completed Warsak Dam at night. On her state visit in February 1961, H.M. Queen Elizabeth II visited the dam as well as the Khyber Pass where she was enthusiastically received by the tribesmen of the area.
Warsak Dam Project Commission.



The Warsak Dam while under construction during the winter of 1959.
The workers who are tribesmen of the Khyber area, are seen here during their lunch hour.

brooding mountains, as one travels and gazes spellbound on the jagged peaks that rise to dizzy heights along the Pass, one's mind goes back to the twilight of history about the time of Cyrus the Great "subjugating tribes of the Hindu Kush and in the Kabul Valley, specially the Gandharians". Then about the fifth century B.C., nearly two centuries before Alexander, we see Darius swirling around the bases of these mountains and the north-western valleys of Pakistan.

In 326 B.C., Alexander the Great of Macedon, having already swept through half of Asia, led his conquering armies down the Khyber along the Kabul River. During first and second centuries B.C., we see the Scythians making incursions through the Khyber Pass into Pakistan only to be thrown out in turn by the Yuichi tribe of Central Asian nomads, the Bactrians, the Parthians and the Sakas.

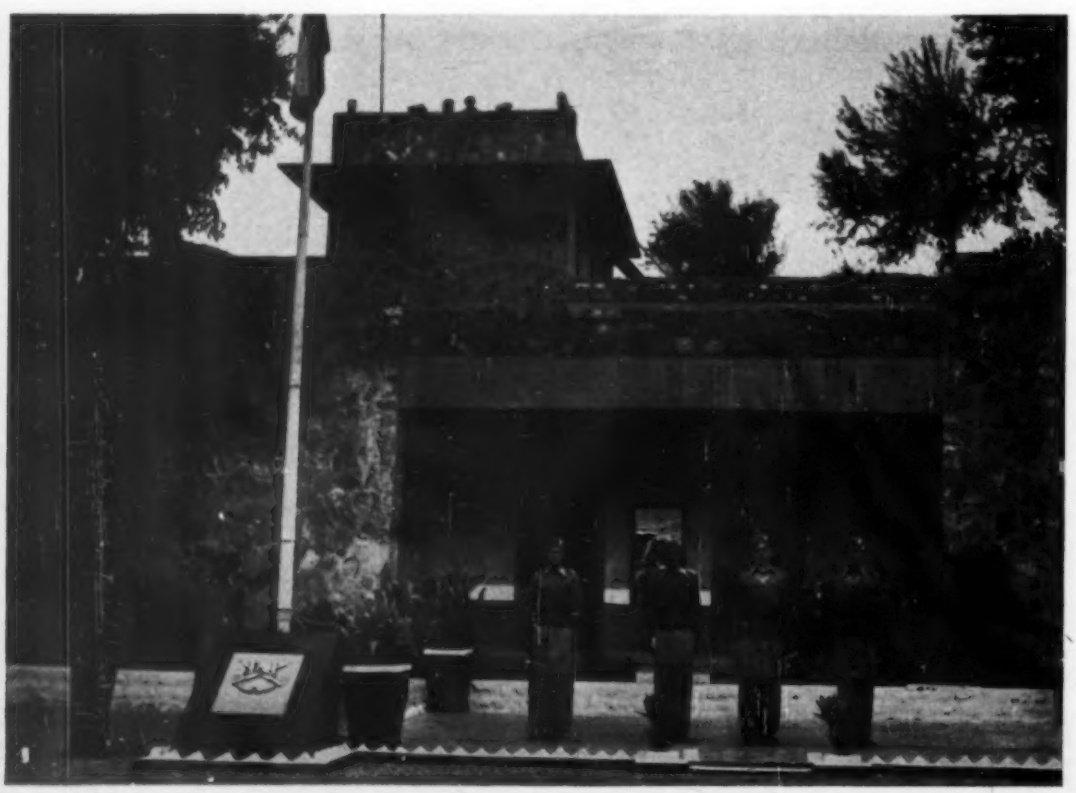
Centuries rolled by as we hear the echo of many adventurers and their repeated invasions of the sub-continent of Pakistan and India until in 1526 A.D., we recognize the resounding clang of an ambitious visionary marching slowly but confidently at the head of a small force of mountaineers. This is Babur, fifth in the line of descent from Timur, born and bred on the Central Asian steppes, in whose veins flowed the blood of Genghis Khan, and who was soon to establish the mighty Moghul Empire from the foothills of Kabul to the shores of Cape Comorin.

Towards the end of the eighteenth century, as the Moghul Empire declined, the Khyber saw the invasion of Nadir Shah of Persia who occupied Peshawar, and having crossed the Indus swept all resistance he met "as flood sweeps away a handful of chaff". Later Afghan rulers, Ahmad Shah Durrani and his grandson, Shah Zaman, also followed the

Concrete blocks bearing the insignia of the various British and Indian regiments erected to commemorate their service in the Khyber area.

Khyber route on several occasions; but the nineteenth century brought some of the memorable battles which the British Indian forces had to wage against the fierce tribesmen of the Khyber area. Bronze plaques and heraldic designs in concrete dot the granite cliffs along the Pass, commemorating the British and Indian army regiments which fought here. Huge concrete blocks set up by the British after the Germans attacked Russia in 1941, are also seen crumbling along the roadside.

For thirty-three miles the Pass twists dizzily through narrow, rocky gorges until it opens up at a place called Landi Kotal, a couple of miles east of the last border-post of Pakistan. It is a small village with a market square within high mud walls. Here tribesmen



The guard room at Torkham, the last Pakistani border post on the Peshawar-Kabul road, is maintained by a small detachment of the Khyber Rifles.

from all over the Khyber hills come down to sell and to purchase food-stuffs, cloth, tea, tobacco, *gur* (crude sugar) and small arms and ammunition. The atmosphere is one of a military camp: everyone is armed with a rifle and wearing a cross-belt studded with cartridges, moving about jauntily, haggling with the money-changers, pedlars and vendors. The place is rich with the aroma of juicy fruits and tempting roasted mutton. Here *shish kabab* and roasted sparrows done over pungent charcoal are a treat to be followed by a round of little bowls of milkless, green tea and *chilam* (smoking pipe), the two signs of common hospitality with the tribesmen.

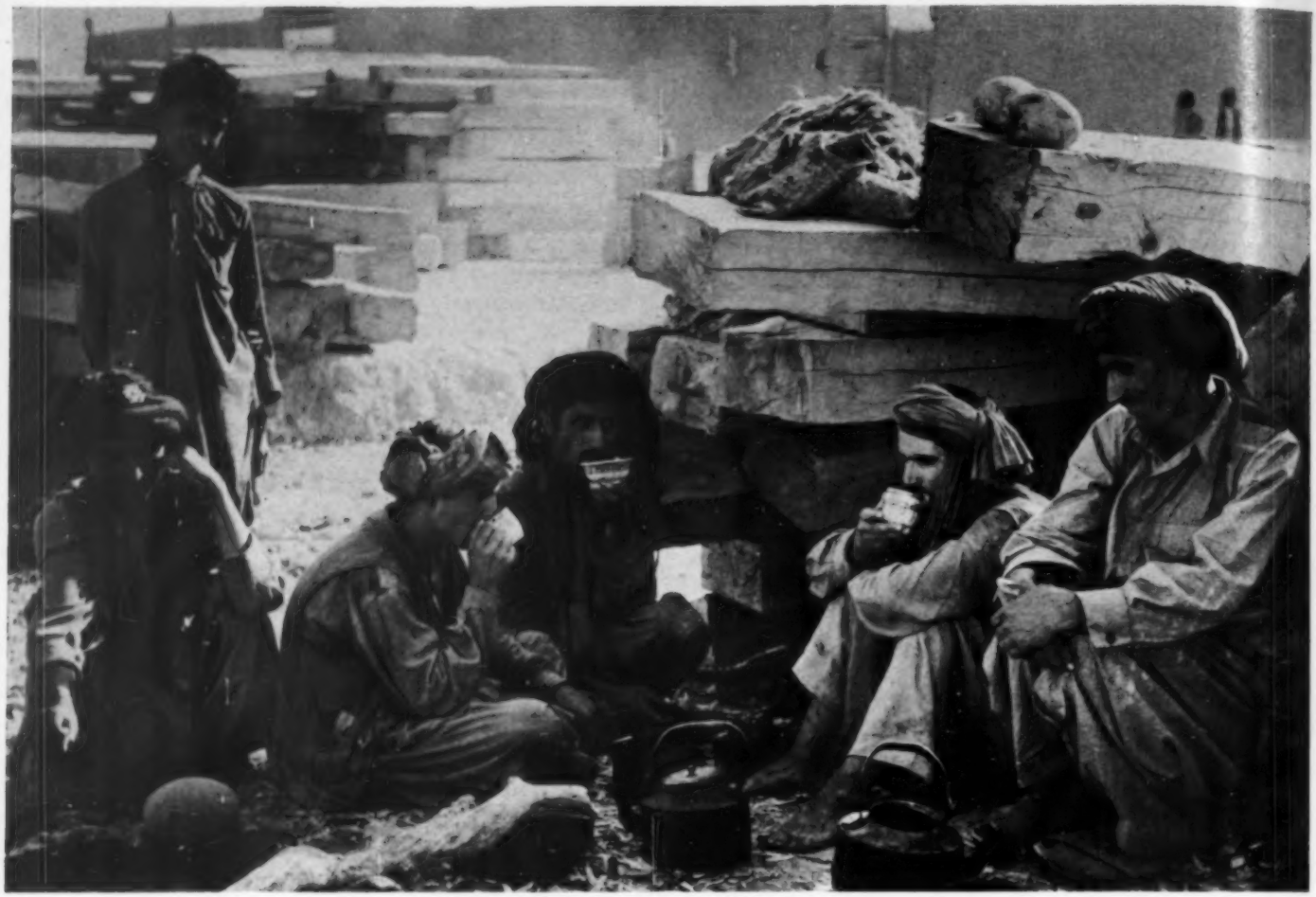
Arriving at last on the Pak-Afghan frontier, the visitor gets a pleasant surprise to see an oasis-like green patch of land with a neat little rest house and a guard room manned by a small detachment of the spick-and-span *Jawans* (soldiers) of the Khyber Rifles who line up under the fluttering flag of Pakistan to greet him at the last border post of the Khyber area.

The Khyber Rifles is one of the twelve units of the Frontier Corps entrusted to guard the 1500-mile long frontier of Pakistan from Mount Godwin Austin in Chitral to the Makran Coast on the Arabian Sea. The Khyber Rifles was first raised in 1887 from amongst the local tribesmen but was disbanded in 1919. During the Second World War, an Afridi Battalion was formed to serve overseas. In March 1946, the Khyber Rifles was reformed from the drafts of the Afridi Battalion, the Tochi Scouts, the South Waziristan Scouts and other tribal people. These guardians of a portion of Pakistan's long frontier are noted for their smart turnout and precise marksmanship.

The rocks and cliffs along the thirty-three-mile defile of the Khyber Pass bespeak the legends of bravery of the tribesmen for whom this rugged life holds charm by the freedom it offers. These tribesmen still guard their freedom with a staunch faith in their own resourcefulness and find happiness in their own environment. They still continue to have their indigenous system of maintaining law and order in the tribal territory through what is called the *Jirga* system.

The Jirga is a body of tribal chiefs which assembles to decide various tribal matters as well as to give findings on disputes arising among the tribesmen. It is usually held in the presence of a Political Agent or magistrate representing the Central Government. The Political Agent possesses the power to call meetings, to select the names of those attending (in some cases), and to moderate the harsh customary punishments. Under this system, although tribal custom and authority of the chiefs and maliks is upheld, the ultimate sovereignty is exercised by the Political Agent acting for the Government of Pakistan.

A group of watchful Khasadars.



Pathan labourers enjoying afternoon tea.

Tribesmen from all over the Khyber hills come to this market in Landi Kotal to buy tea, tobacco, gur, and other goods.

The following types of Jirgas are held in the Khyber Agency:

(i) Jirgas mainly comprising the mullahs (religious instructors) and influential maliks and elders, who decide disputes of various kinds between individuals or tribes. Their decisions are usually made according to the *Riwaj* or the Customary Law, and are binding on all.

(ii) Jirgas consisting of maliks and elders, called the "Council of Elders", are nominated by the political authorities in the semi-protected areas to give findings on all disputes over landed property, money transactions, murders, etc., among the tribes or individuals who are bound by the Government Tigas (Truces). These Jirgas are nominated with the consent of the parties. The cases are then decided by the Political Agent or the Assistant District Magistrate of the Khyber Agency.

(iii) In cases of theft of Government property, raids or murder in the protected areas, the Jirgas comprising maliks and elders are nominated by the political authorities to give findings under the Frontier Crimes Regulation and the cases are decided by the Political Agent or the Assistant District Magistrate of the Khyber Agency.

(iv) Jirgas held by the tribesmen on problems of economic or political nature in the Agency. The tribesmen pass resolutions at such meetings and forward their requests for help to the Government.

An annual Jirga of representatives of various tribes in the area is held at Jamrud in April or May every year, which is presided over by the Provincial Governor or the Political Resident or the Minister for the Frontier Regions. At this gathering the tribesmen put up their joint demands before the Government for their social and economic improvement and for the general welfare of the tribal territory.

The city of Peshawar (Divisional headquarters) which is the main *entrepôt* on the Pakistan side, is one of the oldest cities of Asia, and has for 2000 years been the meeting and market place for the people of Central Asia and Pakistan. Its bazaars overflow with colourful carpets and lamb-skins, pottery, copper-ware, jewellery and trinkets, and thousand other articles brought from the neighbouring lands by caravans and sold by traders and pedlars wearing their colourful dress.

The Khyber has, thus, lived through history as one of the most vital arteries in the life of Central Asian nations, contributing to the political and economic failures and successes of this part of the world.

Three happy youngsters from the Khyber area.

"Packer boats" which have brought fresh iced fish in to Hay River for transfer to refrigerated trucks for shipment over the Mackenzie Highway.

The mill pond for the large new saw-mill at Fort Fitzgerald contains spruce timber cut along the lower Peace River.

A prospective gold mine in the Barren Lands northeast of Yellowknife, supplied entirely by aircraft.

Economic Change in the Mackenzie Valley Area

by WILLIAM C. WONDERS*

Photographs by the author

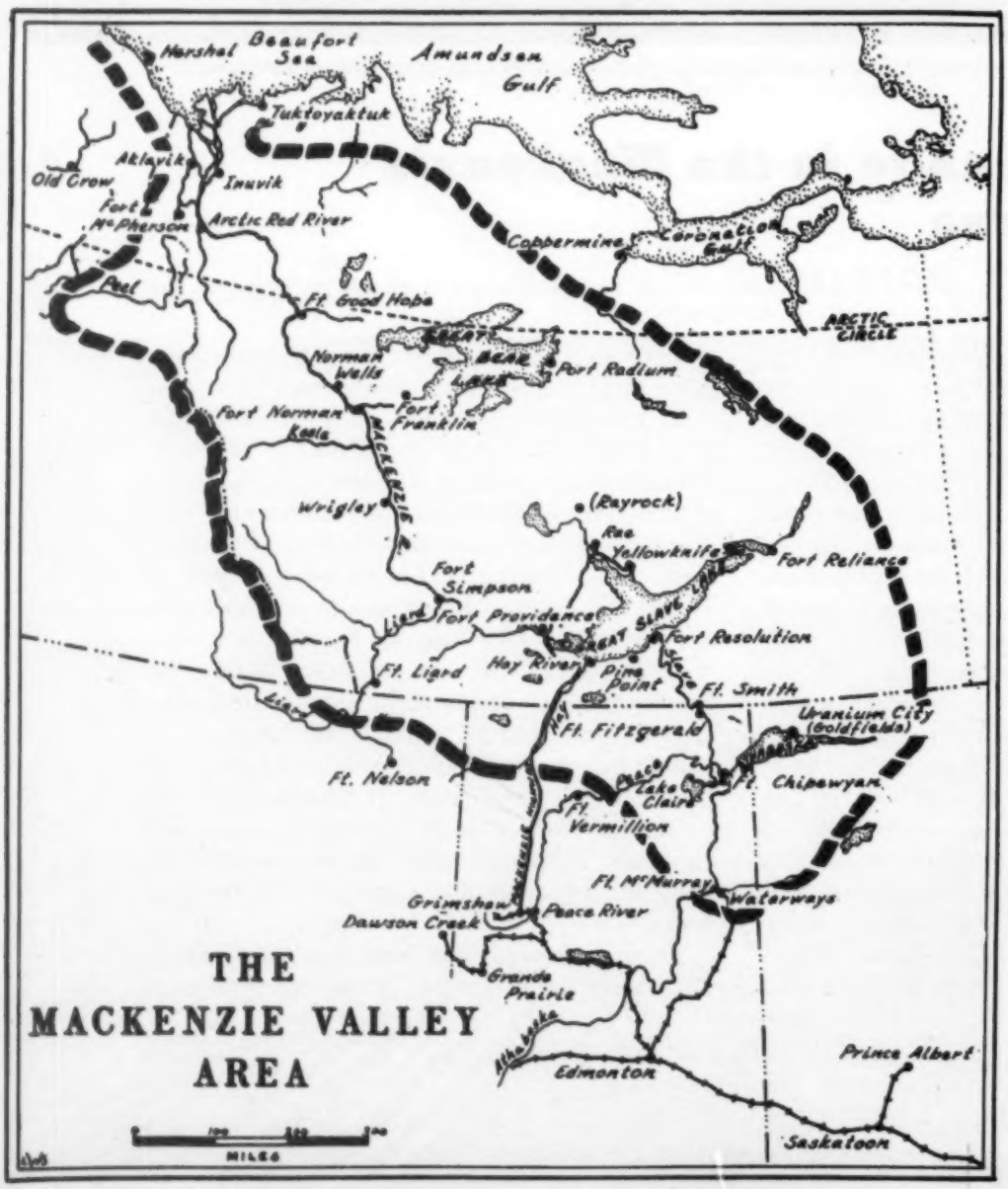
"TERRITORY OF MACKENZIE"—a new name may be added to the map of Canada within a few years. The recent announcement by the Northwest Territories Council that the western part of the Territories is likely to be detached from the rest as a separate entity, produced widespread interest in other parts of Canada. Many problems still remain to be worked out, such as the establishment of exact boundaries, administrative structure, etc., but it is a tangible reflection of the changed conditions which have come about throughout the Mackenzie Valley Area in the postwar years. Although change has been more dramatic in its stark contrasts in the Arctic over the same years, it has been no less significant in this part of the Canadian sub-Arctic, involving parts of northern Saskatchewan, northern Alberta, northeastern British Columbia and the northern Yukon Territory, as well as the western Northwest Territories. Economic change, though only one aspect, has been a critical one.

In a series of excellent articles in 1945 and 1946 in the *Canadian Geographical Journal*, J. Lewis Robinson summarized the geography of this part of the Canadian northwest. The mining rushes of Great Bear Lake and Yellowknife in the 1930's, and the Canol Project of World War Two years laid the basis for change in the 150-year-old pattern of a fur-trade economy. A new economic focus and the framework for an improved transportation system resulted. Yet most of the people in the area continued to follow the old pattern of life and the settlements, if modified by the presence of a few newer structures, were not radically different from those familiar to previous generations. Such is not the case today.

During the postwar years the fur trade in the Mackenzie Valley Area has declined

*The author gratefully acknowledges research grants from the University of Alberta, the Canadian Social Science Research Council, and the Northern Co-ordination and Research Centre, which have made possible his work on the Mackenzie Valley Area.

very seriously. Two factors have always varied—the cyclical fluctuations of the animals, and the instability of price fixed largely by capricious fashion. Even so, variation in the value of fur production in the case of the Northwest Territories, from $2,000,000 in 1950-51 to $757,000 three years later, is quite startling. Average cash income for the trappers in the Mackenzie District varied from $552 in 1950 to $182 in 1954. Regardless of the state of the two variables, the trapper has found himself faced with steadily rising costs for the goods he needs. It should be borne in mind that the meat provided along with the pelt helps out appreciably in food costs, but many trappers have felt it not worth their while in effort and expense, to maintain their equipment and dog teams for such an unpredictable reward. Postwar development of synthetic fur fabrics has introduced yet another discouragement for this traditional industry. The result is that the overall trend is downwards, despite some temporary increases. It is ironic that this should be the case at a time when the fur resource is being managed scientifically more carefully than ever before. The economic crisis of the fur trade in recent years has been especially acute for the native peoples of the Mackenzie Valley Area. Had it not been for other employment, largely in construction, and new sources of income, the problem would have been even more serious. Government policy is for increased education to make it possible for these people to take employment in other types of industry. The fur trade probably will always remain an element in the economy of the area, but it will be a relatively less and less important one. The fur trading post of yesterday is now primarily a general store — and may even include a deep-freeze locker!



THE MACKENZIE VALLEY AREA

Besides providing a habitat for the fur and game animals, the forests of the Mackenzie Valley Area traditionally have furnished the inhabitants with wood wherewith they can build their cabins and heat them through the long winters. (The northward projection of the forest almost to the shores of the Arctic Ocean itself, in contrast to central and eastern Canada, is one of the most distinctive features of the area.) This additional usefulness remains to-day, even though many of the inhabitants, especially in the larger centres, have modernized their homes to the

The old way of life for the native people of the Mackenzie Valley Area is symbolized by this fish camp at Arctic Red River.

point where they are indistinguishable from those in southern Canada, and oil furnaces and heaters are displacing the wood-burning stoves. Increased economic activity has seen a corresponding rise in the demand for wood for a variety of purposes. As with most other resources, scientific management services have been extended to the forests and more accurate inventory instituted. Much of these forests must be considered marginal from most commercial points of view. Those of greatest value lie in the valleys of the Slave and Liard Rivers, with some also in the southern Mackenzie Valley proper.

Output of spruce lumber has increased appreciably in the postwar years, but a new emphasis in type of production has occurred. Previously, small saw-mills of sporadic operation have been the rule. In 1956 large timber concessions were granted along the lower Peace River in Wood Buffalo National Park and two large saw-mills, each of over 10 million board feet annual capacity subsequently were established, one on the Peace River, the other at Fort Fitzgerald. (A plywood plant utilizing local balsam poplar is planned in connection with one, but has not been constructed as yet.) Along with a 4 million board feet capacity mill in the same area operated by one of the northern mining companies, a new era of lumber production began and many smaller mills have ceased operations.

A new stress has been given another local resource in the large scale development of commercial fisheries in the postwar years. Commercial fishing was resumed on Lake Athabasca in 1951. It provides seasonal employment for about forty men and yields an annual catch of over one million pounds. Since 1948, Lake Claire, immediately west of Lake Athabasca, has developed a specialty fishery of local importance based on goldeye, the gourmet's fish delight. The most important commercial fishery in the entire Mackenzie Valley Area now operates on Great Slave Lake, centred on Hay River, and dates from 1945. This is concerned chiefly with whitefish and lake trout for eastern United States markets. It operates during summer (June-August) and winter (December-March), under careful scientific supervision. The annual quota of 9 million pounds has never been reached, for a variety of

A modern home at Uranium City.

reasons, but the market value of the catch is usually $1½ million to $2 million. From 200 to 400 men are usually licensed to fish, with the greater numbers involved in the winter fishery which is carried on from cabooses or cabins out on the lake ice.

The well-based reputation of the area for sport fishing has been perhaps the greatest single factor in the rise of a tourist industry. This has been growing very markedly in recent years, especially as transportation connections with "the Outside" have improved. The opening up in 1959 of a unique (and hitherto long-vanished) hunting experience—for buffalo—in the Slave River area, is providing a further attraction for the sportsman. Anticipating a major increase in the tourist and sports activity such as has been felt already on the southern margins of the area, January 1960 saw the formation of a Northwest Territories Tourist Association in Yellowknife. Perhaps there is no better reflection of the passing of the "Old North" than this!

The economy of the Mackenzie Valley Area was dominated by the fur trade almost to World War Two. Since that time, mining has replaced it as the most important industry and it is to the mineral wealth of the area that most people look for the major support for continued economic development. Most of the activity based on this resource has been concentrated until recently in the eastern sector of the area, which falls within the Canadian Shield geologically.

During the late war and immediate postwar years the Yellowknife area experienced its second big gold rush, with major mines brought into production. By 1948, value of gold production almost had equalled its previous high of $3.8 million in 1942, and by 1950 it had doubled that figure. In 1959, the value of gold production was $13.4 million. Hampered by a fixed price for gold and increasing costs, some mines have been forced to shut down, but to-day there are three gold mines producing in the Yellowknife area, with others nearing production, including one 150 miles to the northeast, in the Barren Lands.

The postwar demand for uranium encouraged an active exploration program for that mineral as well as continuing to support the Port Radium mine. One new uranium mine came into production in 1957 at Rayrock, about 100 miles northwest of Yellowknife, but shut down in 1959 because of unfavourable ore conditions. The most significant development in metallic minerals since World War Two was the discovery of a major new uranium field in the Beaverlodge area north of Lake Athabasca. About twenty new mines were opened, and a new, modern, planned town, Uranium City, was created to serve the area. In 1958 the Beaverlodge area produced 58 million dollars worth of uranium (Port Radium accounted for another 9½ million dollars) and supported a local population of about 5,600. Since that year the value of uranium production has declined appreciably.

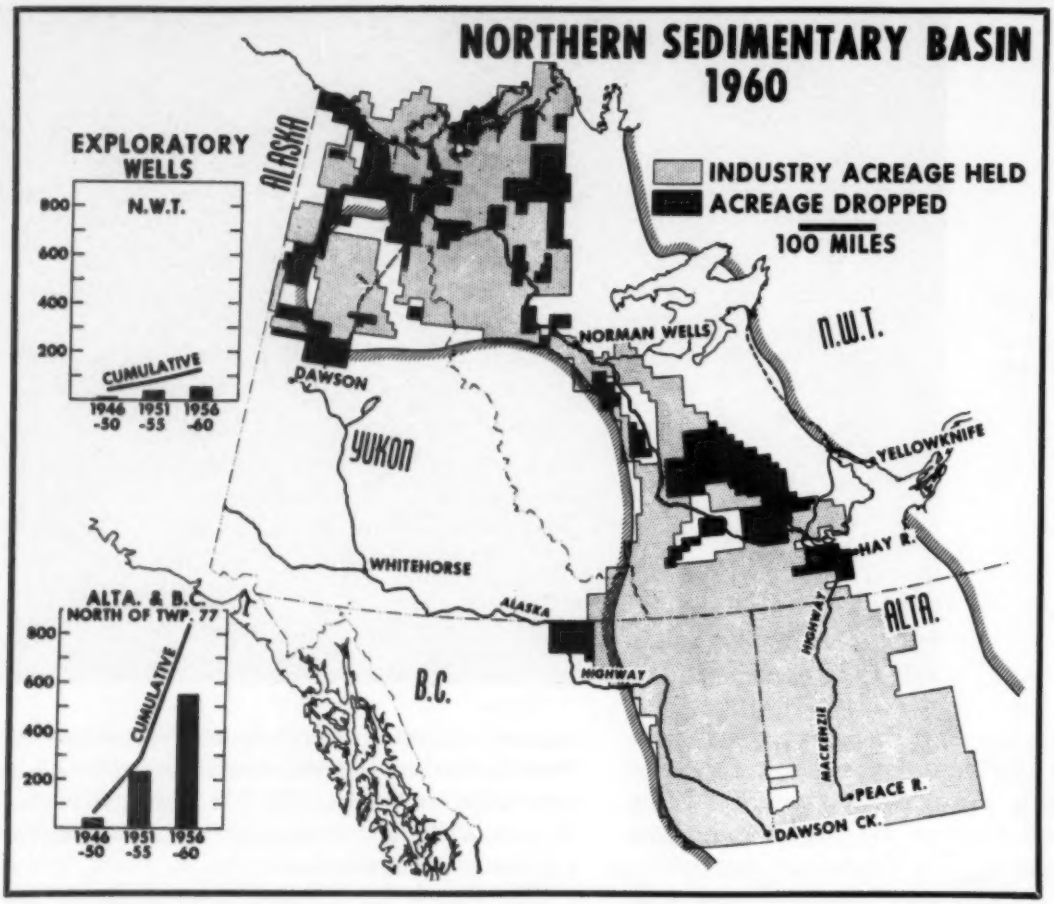
New-type housing for Eskimo residents at Inuvik in the Mackenzie delta.

The decision to end the guaranteed sales contracts in 1962 has resulted in most of the mines shutting down, their contracts being taken over by the two very large remaining mines in the area. The Uranium City district —the latest of the many "boom" camps in the history of mining in the Canadian North —is currently in a period of re-adjustment. These mines, as all others in the Mackenzie Valley Area, are handicapped by distance from market, and only exceptionally high quality ore can offset the higher operational costs involved. 1960 saw the closing of the Port Radium mine because of exhaustion of ore, and with it the departure of Canada's first radium and uranium mine.

The announcement that a new tungsten mine will begin production in the Flat River area of the Cordillera, close to the Northwest Territories-Yukon border, represents a further advance in mineral production. However, this area will be served from Watson Lake, British Columbia, so much of the resulting benefit will fall outside the Mackenzie Valley area.

Large scale exploration and proving-up programs occurred during the 1950's in two widely separated areas: south of Coronation Gulf where copper-nickel ores are involved, and south of Pine Point on Great Slave Lake where a huge lead-zinc ore body has been outlined. Development of the latter is linked with a proposed railroad extension from the south. Although considerable feeling was generated amongst the supporters of the two suggested routes (north from Waterways or from Grimshaw), preliminary survey work is currently under way for the western route. A new mining community of up to 2,000 population is predicted.

The search for oil and natural gas in the area has grown spectacularly in the 1950's and recently has over-shadowed the metallic minerals in interest. After the war, the one producing oil field at Norman Wells cut back on production as the Canol Project ended. Reserves were not sufficient to warrant development for world markets, though the mining boom encouraged output many times that of prewar years. Not until about 1951 and 1952 did the northward rush from the dramatic postwar Alberta oil discoveries become infectious. In 1951 two wells and test holes were drilled in the Northwest Territories; in 1952, 16 were drilled. In short order most of the sedimentary basin of the Mackenzie Valley Area became blanketed with exploration permits. As of January, 1960, there were 1,530 oil and gas exploratory permits in good standing for mainland areas in the Northwest Territories, covering 73 million acres. During the summer of 1959 over 50 crews, conservatively estimated as involving more than 400 men and 60 aircraft, were active. During the winter of 1959-60 Canada's first oil well north of the Arctic Circle was drilled in the Mackenzie Valley Area. Very large reserves must be proven before production would be commercially feasible and to date no large discoveries have



been made. However, the search is being continued by several major companies with immediate benefit to the area as a stimulus to general business activity and with the hope always that oil will be discovered in sufficient quantity to warrant production in spite of the high costs involved.

The immensity of the area's petroleum reserves in the so-called Athabasca Tar Sands north from McMurray has long been known. Over the years there have been many attempts made to tap these enormous reserves. Renewed attention has been given this project in postwar years by several companies, and there are currently a number of experiments in process in the area.

Much of this postwar activity in the Mackenzie Valley Area would not have been possible without marked improvement in the transportation facilities. World War Two provided ten new airports from Waterways northward to Norman Wells. These have since been greatly improved and extended, and regular scheduled air service is now provided throughout the area as far as Inuvik in the Mackenzie delta. Charter aircraft bases are available at many centres for use to points without airport facilities. The "bush pilots", those colourful elements in the population of northern Canada, continue their invaluable service in the postwar years. If perhaps less colourful than in the more precarious earlier years, they still cheerfully take on any task, from flying a native hunter out to a game area to providing an isolated mine with regular air freighting service.

World War Two also laid the basis for improved water transportation service. Increased numbers and new types of tugs and barges formed the nucleus of a postwar modernization program. All-steel vessels and barges now prevail while the diesel tugs, fitted with radar and depth sounders, have become steadily more powerful and larger. New dock facilities and navigation aids have been installed. Two large companies now provide more reliable service, though the traditional hazards of the Mackenzie waterway still remain—shifting river channels, fluctuating water levels, and treacherous lake water. The original water carrier, the Hudson's Bay Company, retired from this activity several years ago.

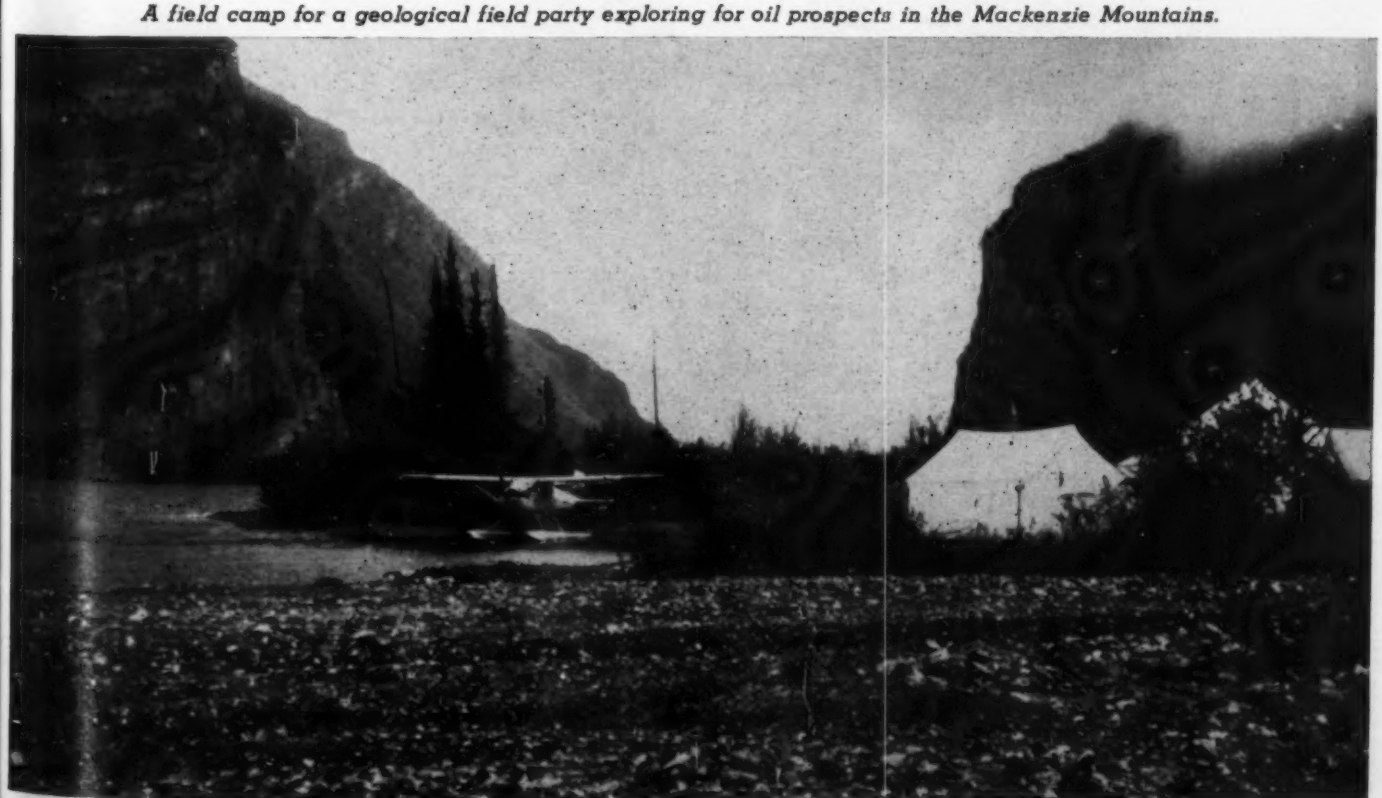
The latest element in the transportation field to enter the Mackenzie Valley Area has

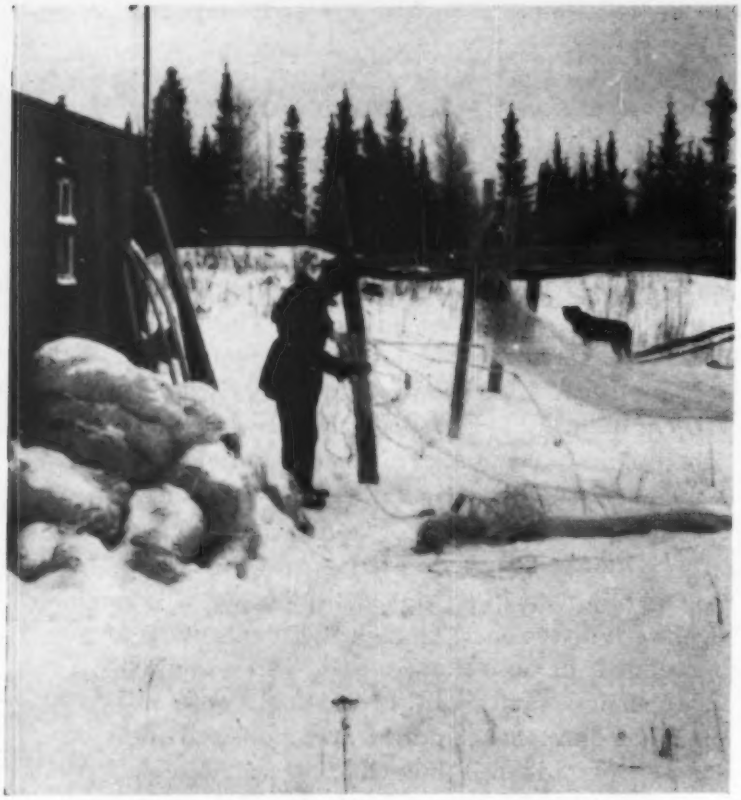
been the motor truck. During the war, emergency winter trails were hurriedly slashed through to Norman Wells, but generally allowed to fall into disuse almost immediately. Primarily to serve the new Great Slave Lake fishery, a 400-mile road, the Mackenzie Highway, was opened up from Hay River to Grimshaw in 1945. This was the first road contact between the Northwest Territories and the rest of Canada, and really marked the beginning of a new transportation era in the area. This in turn facilitated access to the area for oil exploration crews. Their seismic lines in turn often were converted into winter truck roads so that some communities hitherto isolated once winter freeze-up set in, found that they could be served by truck. Many projects which otherwise would have been severely delayed by freeze-up, have found the reverse to be true in recent years because of winter truck roads. Meanwhile extension of all-weather roads into the area continues. 1960 saw the Mackenzie Highway continued 281 miles around the west end of Great Slave Lake and into Yellowknife, and regular bus, express, and trucking services are now provided to and from Edmonton. Preliminary road work is under way eastward from Yellowknife, while construction is well along which will link Fort Smith with the Mackenzie Highway through the Wood Buffalo National Park.

Yet if great improvements have been effected in the transportation facilities in the area since World War Two, it is universally conceded that further economic progress in the Mackenzie Valley Area depends primarily upon still greater improvements. The Great Slave Lake railway extension is cited as a prime illustration. This area always will be geographically remote from the key areas of population and industry. Economic development of the area's resources is constantly confronted by the cost of transportation.

Economic change in the postwar years has generally, but not universally, been in an upward direction. Although the fur trade has declined in importance and some mining properties have been abandoned, new resources have been tapped and increased use made of old ones. These have promoted a significant increase in local population, including the creation of new settlements and a general improvement in the standard of living. Many of the repercussions, especially in the social and political spheres, are proving just as far-reaching as the economic changes themselves. At no time in its history has the Mackenzie Valley Area felt the impact of change as completely as in the past fifteen years. Regardless of feelings in the matter, the days of the "old North" are gone.

A field camp for a geological field party exploring for oil prospects in the Mackenzie Mountains.



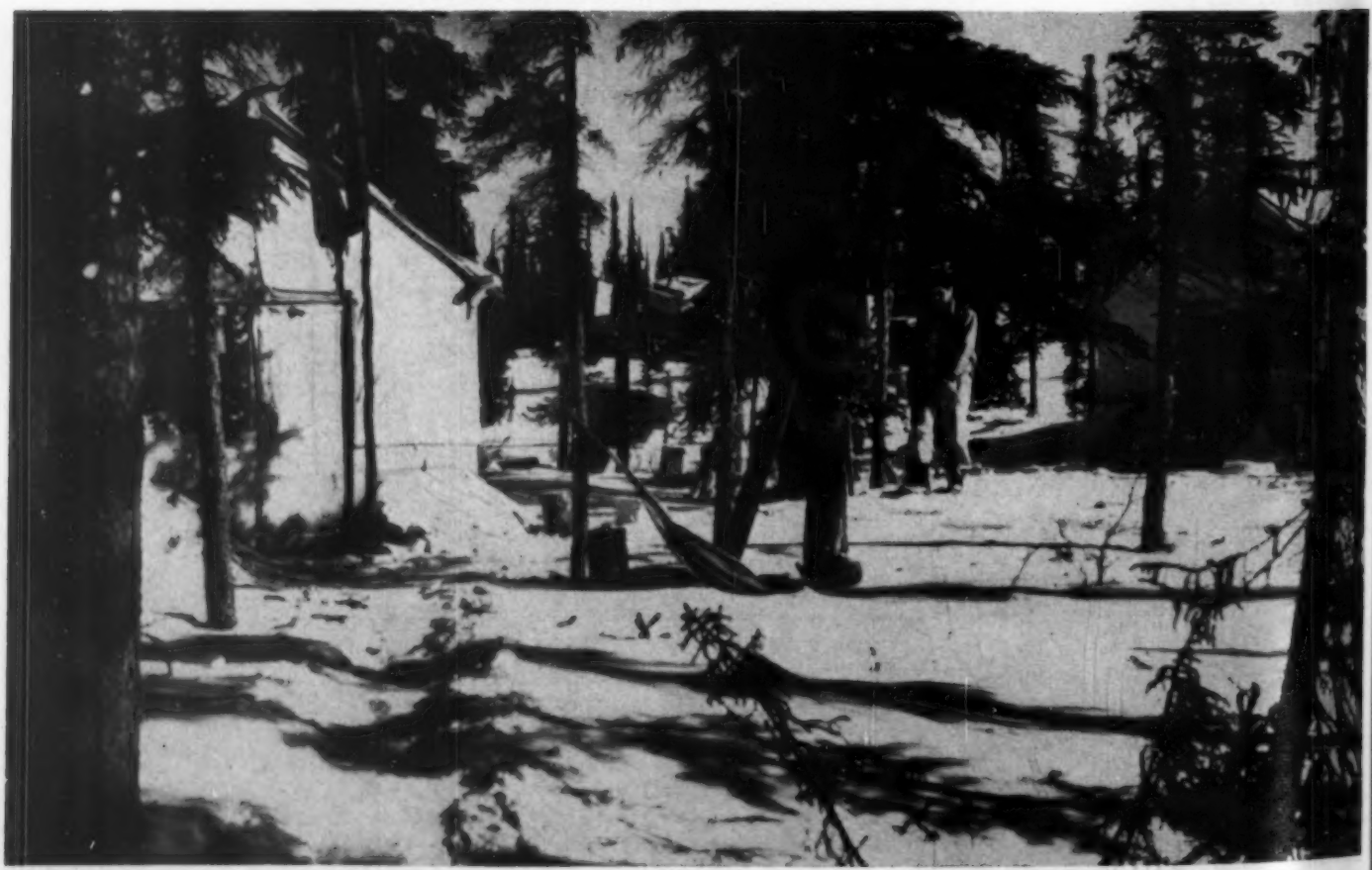


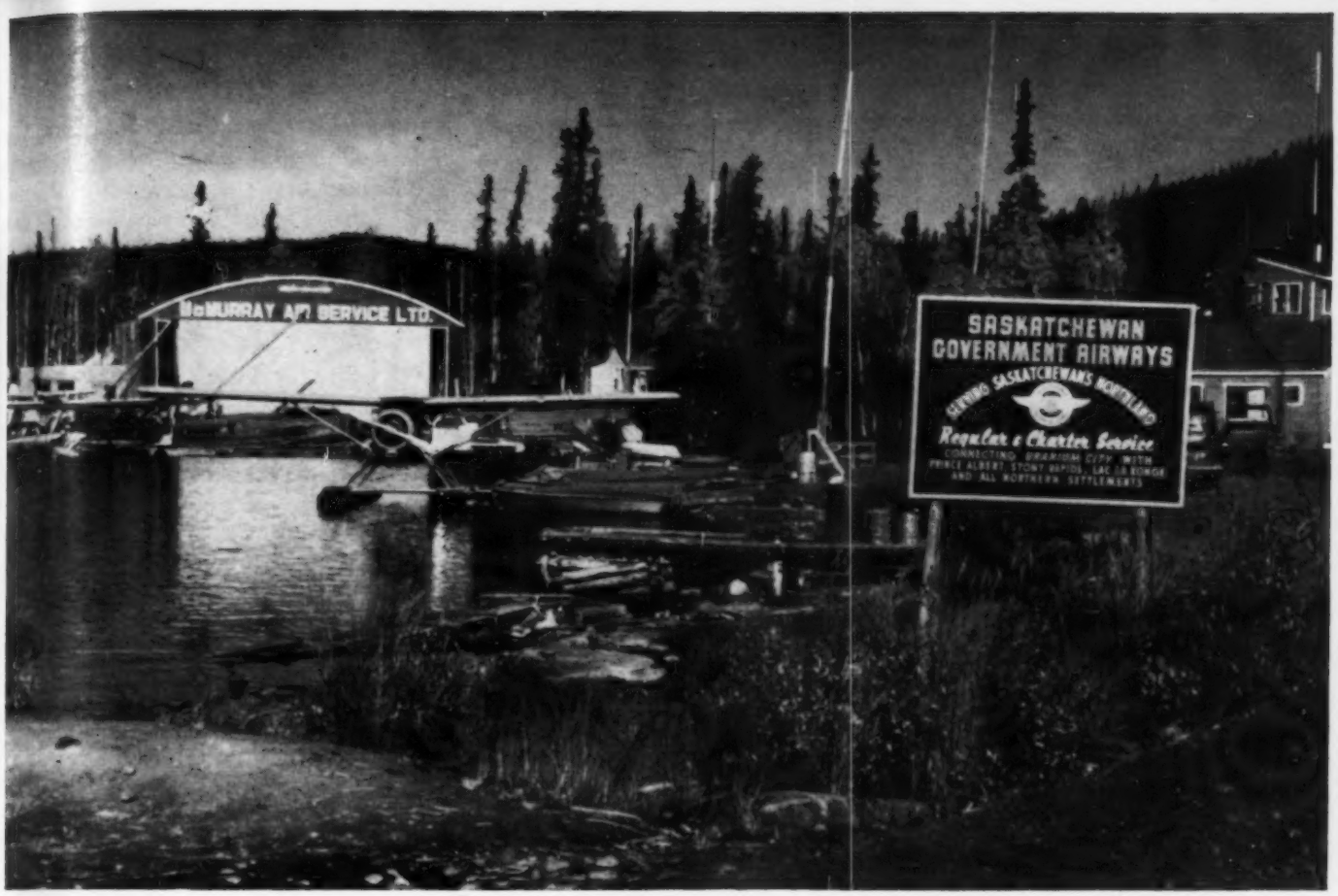
A fisherman spreads his nets to dry alongside his portable caboose at Hay River, after the closing of the annual winter fishery on Great Slave Lake.

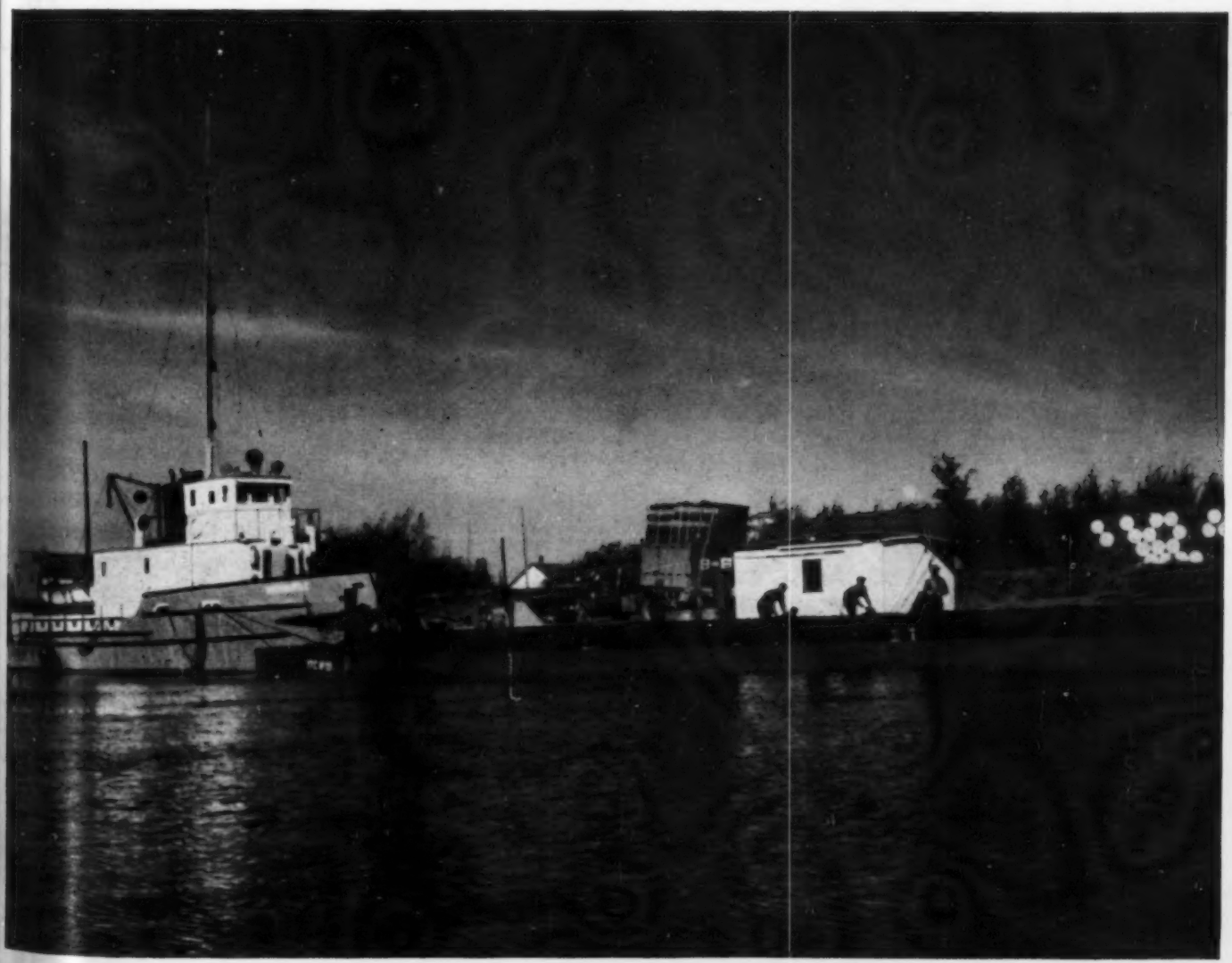
Charter aircraft base at Uranium City. Float or ski-equipped planes operate over wide areas from such bases.

A modern diesel tug with a loaded steel fuel barge at Hay River.

A field exploration base camp in the "bush" southeast of Great Bear Lake. Geophysical and diamond drilling crews are flown out daily to the field areas.




McMURRAY AIR SERVICE LTD.
SASKATCHEWAN
GOVERNMENT AIRWAYS
SERVING SASKATCHEWAN'S NORTHLAND
Regular & Charter Service



EDITOR'S NOTE-BOOK

We regret that a small number of copies of the August 1961 issue were bound incorrectly. Those we know about have been replaced. If there are others, would you please notify us as soon as possible since our stocks are limited and we are reserving them for replacement purposes until we are confident that all needs have been met, rather than accepting orders for single copies.

* * *

H. S. Bostock (*Physiography and Resources of the Northern Yukon*) is a senior geologist with the Geological Survey of Canada. He was born in Vancouver and received his early education in Canada and in England, attending Charterhouse School in Surrey. He obtained his B.Sc. in 1924 and M.Sc. in the following year from McGill University, Montreal, and his Ph.D. in Geology from the University of Wisconsin in 1929. Dr. Bostock has been with the Geological Survey of Canada since 1929.

* * *

W. G. Campbell (*The Search for Oil in the Yukon Territory*) was born and educated in Edmonton, Alberta. After serving with the R.C.A.F. during the Second World War, he attended the University of Alberta from which he graduated with a B.Sc. in Engineering in 1949. After serving for a year as petroleum engineer with Imperial Oil Limited, Mr. Campbell commenced work for Western Leaseholds Limited at Calgary in 1950. In 1952, he was transferred to the associate company, Western Minerals Limited, as Project Manager. In January 1957, he was loaned to the Peel Exploration group for six weeks; since this time, Mr. Campbell has remained with the Peel group as Project Manager, and has been directly responsible for oil and gas exploration in the Yukon.

* * *

A. B. Rajput (*Khyber: The Pass of Destiny*) is a Pakistani writer and freelance journalist. He studied journalism, history, archaeology, and oriental classics at the Universities of Punjab, Nagpur, Bombay, and Delhi. For a period, Mr. Rajput worked as editor of the N.W. Railway Magazine, La-

hore, and also for a time as Curator of the Delhi Museum. He is the author of numerous publications and articles which have appeared in foreign as well as Pakistani periodicals. For his publication, *Iran Today*, he was awarded the Order of Merit in Literature from the Government of Iran in 1952.

* * *

William C. Wonders (*Economic Change in the Mackenzie Valley Area*) is Professor and Head of the Department of Geography at the University of Alberta. From 1948 he was on the staff of the Department of Geography at the University of Toronto until 1953 when he went to the University of Alberta. Professor Wonders was a founding member and is now Chairman of the Directorate of the Boreal Institute at the University of Alberta. He is also president of the Canadian Association of Geographers, and a member of numerous advisory and planning boards. He has undertaken studies in land use and soil survey work in southern Ontario, settlement in western Newfoundland, the Queen Elizabeth and Canadian Arctic Islands and Greenland, and latterly the Mackenzie Valley.

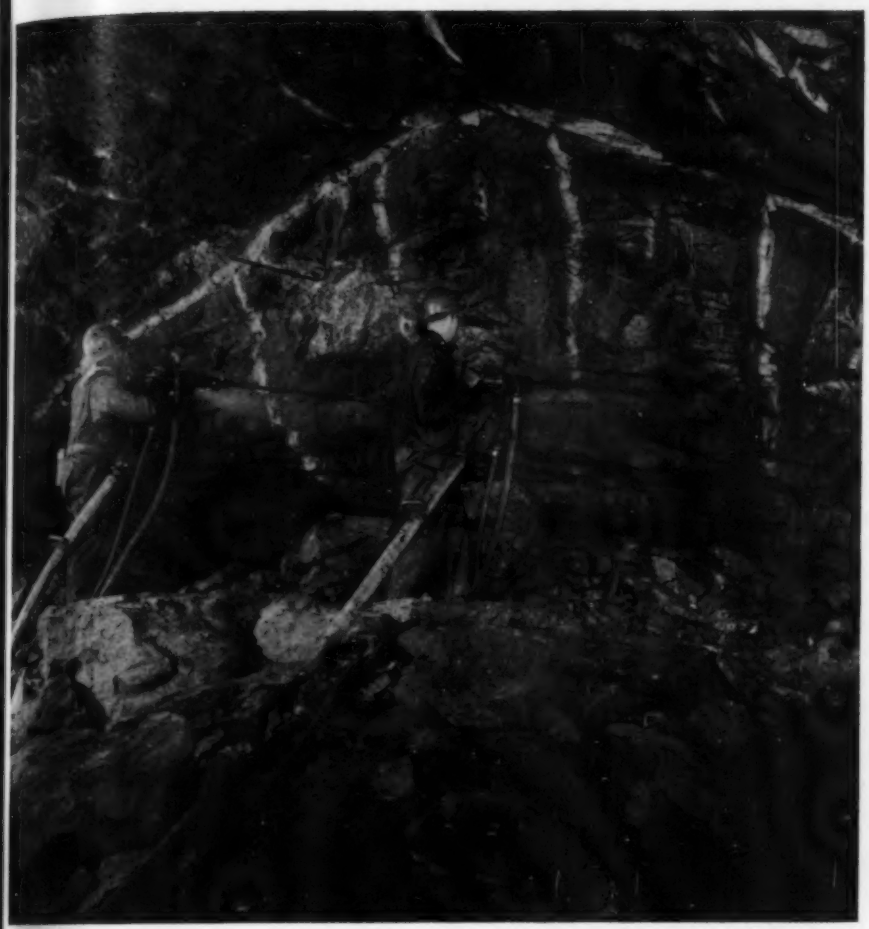
* * *

AMONGST THE NEW BOOKS

The Geography of Norden
Edited by Axel Sømme
(William Heineman and Sons, Toronto. 363 pp. $12.00)

In all three Scandinavian languages the word "Norden" means "The North". In an introductory chapter Professor Isachsen explains that mainly since World War I this word has been used widely as a name for the small North-European countries embracing Denmark, Iceland, Finland, Norway and Sweden. The book constitutes an extensive treatment of nearly all aspects of the geography of these countries, compiled and written by many of the leading geographers of Norden. The text was prepared primarily for presentation to the professional geographers attending the 19th International Geographical Congress, which was held in Stockholm in August, 1960. A secondary, and perhaps more vital result, leading from this, is that a brilliantly conceived and executed work has been made available for the teaching of geography at the university level.

(*Continued on page IX*)



Our picture will be a familiar one to our readers since it might have been taken almost anywhere in the Canadian Shield. It shows miners drilling in the recently-opened mine of The International Nickel Company of Canada at Thompson in Northern Manitoba. The November issue will be devoted entirely to Northern Manitoba, with one article on the country itself, one on the mine and one on the power development at Kelsey on the Nelson River.

Although production was only started in March of this year, this latest addition to the mining enterprises in Northern Manitoba has already made a significant contribution to the economy of that part of the province and indeed to Canada. Probably of at least equal significance is the availability of hydro-electric power in the area on a scale sufficient to attract further development. We will hope to record further expansion in the years ahead as new discoveries are made or known resources are tapped to serve world markets.

Information and Enquiries About Membership

Members are invited to nominate for membership any of their friends who might be interested in joining the Society. We will send them further information about the Society and about the *Canadian Geographical Journal.*

Non-members are invited to apply for membership or for further information. We would welcome you into the Society.

Please copy, or fill out, the form below and send it to us. We will act accordingly.

To:— The Executive Secretary
The Royal Canadian Geographical Society
54 Park Avenue, Ottawa 4, Ontario

Check here

For Members
I nominate for membership in the Society the person named below. Please send him/her information about the Society and about the *Canadian Geographical Journal.* ☐

For Non-Members
I want to become a member of the Society, and to receive the *Canadian Geographical Journal* monthly. I enclose annual dues of five dollars ($5.00). ☐

I desire further information about the Society and about the *Canadian Geographical Journal.* ☐

Member's Name.....
.....
street
.....
city, zone, province

Candidate's Name.....
.....
street
.....
city, zone, province

Annual Membership fees of $5.00 for European and sterling area members are payable in sterling, 36/-, to the Society's European Representative:

W. H. Corkill
The Mead, West Dumpton Lane,
Ramsgate, England

United States residents wishing to become members of the Society should remit the annual membership fee of $5.00 (U.S. funds at par) direct to the United States Representative:

Professor William L. Mayo
P.O. Box 1
Ann Arbor, Michigan, U.S.A.

(*Continued from page VI*)

Physical geography is dealt with primarily within a group of general chapters where Norden is considered as a whole. This includes the results of much of the most recent research in aspects of glacial geomorphology, for instance, in which field the geographers of Norden hold a leading position. Also included here is a chapter on population and settlement and one on natural resources. Apparently it was only after some hesitation that the editorial committee decided to treat economic geography by countries, despite the recent trend towards unification. However, as the present-day economics developed behind projecting trade barriers it was decided that "differing past developments as much as disparities in natural resources" had to be taken into account. As this indicates, the extensive use of the historical approach is characteristic of the volume and the result is a vivid and highly readable explanatory geography which serves to emphasize both the artistic and the scientific basis of the discipline.

The five final and lengthy chapters deal with the countries of Norden individually. Uniformity in treatment has been avoided deliberately and the success of the attempt to emphasize diversities in both landscape and cultural background of the national units is readily apparent. Thus silviculture receives most extensive treatment in the chapter on Finland, while fishing and water power is emphasized for Norway and manufacturing industries for Sweden. Denmark and Iceland, with their individualistic physiques, receive more detailed treatment in physical geography.

The text is illustrated with hundreds of excellent diagrams, sketch maps, line drawings, photographs and coloured plates, and a large amount of basic data is presented in an admirable manner. The linguistic presentation, also is of a very high standard and very few minor printing errors have been detected. A selected bibliography and a place-name index have been appended, although this reviewer would have preferred a somewhat more extensive bibliography and a general index.

The editor is to be congratulated on the compilation of numerous diverse contributions and their welding into an integral whole. This fine work should become an essential text, not only for all geographers and laymen interested in Norden, but for geographers at large, because of the excellent example it establishes in the presentation of a geography of a group of countries.

J. D. IVES

Dr. Ives is Assistant Director at the Geographical Branch of the Department of Mines and Technical Surveys, Ottawa.

Geography in and out of School
by E. W. H. Briault and D. W. Shave
(Clarke, Irwin and Company Limited, Toronto. 199 pp. $1.85)

"The geography taught in school must be the 'Geography of geographers', based on the facts and using the principles and techniques of a discipline which is both scientific and humanistic".

So stated, Drs. Briault and Shave have set forth one hundred and eighty pages full of thoughts and ideas on the teaching of geography to students ten years of age and older. The book offers many concrete and helpful hints to the teacher and also many sound criticisms of poor and improper teaching techniques.

To start with we are told to begin at the beginning, to go from the particular to the general, from local to strange areas, from a farm to the prairies, from a mine to a mining area, from a large scale map to the Atlas, from weather to climate. The study of Geography must be based on an appreciation of the reality of the subject matter. For example: *unreality*, a map of North America with a shaded area said to represent the wheat growing area of North America; *reality:* an oblique air photograph of a Dakota's farm in which the farmstead and stretching wheat fields may be seen.

The authors point out that a high majority of our students are urban dwellers and have had no opportunity of observing the land, and therefore recommend first a look at a farm and secondly a field trip. To be successful a field trip needs three steps of preparation; (a) in the classroom, (b) the trip itself, (c) the school follow-up. Good field work in brief is "accurate observation accurately recorded". They offer some practical techniques on how to go about this in rural and town areas, and right about the school. Most valuable to the teachers will be suggestions on how to make observations of earth movements, map orientation and weather.

After the students have viewed the land first hand they should look at a drawing of what they have seen—best done by large scale maps. The authors point out "the ability to use a topographical map is something which can bring lasting pleasure, and has a continuing value to anyone whose interests extend beyond his own rock garden".

In discussing "Capes and Bays" geography, the authors wonder "whether we may not have moved a little too far away from the learning of good honest facts". However, no consideration is given to the idea that geography must be memorized, or in

fact any of it that cannot be interrelated with other parts of geography or other disciplines. They favour what they call a "Concentric Syllabus". This syllabus begins with a local or near at hand area, then increase in area to the home country, and finally to more distant parts. A theme or topic is studied in each part: i.e., the production of wheat (1) growing of wheat at a nearby farm, (2) wheat growing in Southern Ontario, (3) wheat growing in Western Canada.

The teacher is reminded that to be successful, he must keep up to date; "we are brought back to the fundamental aspect—it all depends on the teacher". Above all, he must be a person of wide interests, for much of the success of his teaching depends on his ability to handle material from related subject and to integrate it and distil it for the benefit of his pupils. The teacher must constantly beware of misconceptions of terms and ideas such as: "a river basin", "a belt", "a cove", "a peak", "a pole", and "relief"; or winter to a Congolese as to an Eskimo; or very wet to a person from Calgary or Santiago, Chile, to one from Prince Albert.

A brief bibliography and index complete the book.

This fine little book full of suggestions for the teaching of Geography in Secondary Schools was written by two teachers, for teachers. Its small size allows for quick reading, but it will be referred to time and time again. At the price, no senior teacher of geography can afford to be without a copy G. E. CARSWELL

Mr. Carswell is Vice-President of the Allan A. Martin Junior High School at Port Credit, Ontario.

* * *

The Curve of Time
by M. Wylie Blanchet

(Copp Clark and Company, Limited. Toronto. 202 pp. $3.25)

This is a pleasant holiday book describing the adventures of the authoress and her children for many summer months during the school years of the young family. Their summer home was a twenty-five-foot boat in which they explored the islands and inlets that lie between the coast of British Columbia and Vancouver Island. Often they followed the course that Captain George Vancouver had taken in 1792, always hoping to find a seaway that would lead him to the other side of those immense mountains that swept down so sheer to the sea.

Here amid the coastal splendour of British Columbia the family lived a timeless, carefree life of their own. The management of the boat and the domestic needs were well within their grasp; fishing and swimming in the salt water was a part of their daily routine and they learned how to live comfortably in the cramped quarters of their cruiser, or on the free and spacious islands where they camped, taking the dangers of difficult tides, swift currents or sudden squalls as part and parcel of daily life. In their boat they encountered killer whales, and on land they met with Indians who still make dug-out canoes; they met a cougar and at times had the unwanted company of prowling bears. They grew familiar with the beauties and perils of the coast, that moulded their every day happenings; it was the weather conditions rather than the clock that marked the hours for them, the joys of anchoring for the night in some well chosen creek, or of setting sail for the joys of exploring their way next morning. There is an atmosphere of balanced contentment about this book which makes easy reading. One shares the leisure of the coastal holidays, enjoyed to the full by those to whom the delights of cruising and the natural beauty of British Columbia made up a very rich part of life.

SYLVIA SEELEY

* * *

Recently Received from Publishers

The Lonely Land. **By Sigurd Olson. (McClelland & Stewart, Limited, Toronto.) An account of those solitary regions around the Churchill River where the early voyageurs made their trading journeys, piloting their heavily-laden canoes in defiance of storms, rapids, hostile Indians and perils of every kind.**

* * *

The Living Land. **By Roderick Haig-Brown. (The MacMillan Company of Canada, Toronto.) This is a condensed account of all the natural resources of British Columbia, very well illustrated and elaborately produced.**

* * *

A Geography of Europe. **Edited by George W. Hoffman. (The Ronald Press Company, New York 10.) This valuable compendium defines the seven basic regions of Europe and shows how their economic and political geography has been determined by the physical and historical conditions peculiar to each important area.**

* * *

St. Ives Scrap Book. **By S. Canynge Caple. (Published privately by the author at St. Ives). This is the very individual story of an important mining district in the County of Cornwall, England, where modern progress marches side by side with ancient tradition and custom. It is an excellent local guide book.**

Welcome home!

The smile . . . the shining eyes . . . that little, so-familiar gesture . . . suddenly, you're *there*, in Britain, in Europe—by TCA. Your mother . . . friends . . . they want to welcome you. We see it, more and more every year, the vibrant joy of people going to Europe to visit. In the fall, when fares are one third less than during the summer, TCA's great jets to Europe are filled with people who make the most of savings—giving the joy of their visit, having the happiness of being there. Look at the facts and figures. After October 1st, it's Economy Season on TCA! See your Travel Agent or call

TRANS-CANADA AIR LINES (TCA) **AIR CANADA**

After Oct. 1st, your TCA fare to Europe *plus spending money* could be *less* than the fare alone *now!*

You save *one third* on these low TCA 17-day Economy Excursion Fares which give you up to 2 full weeks in Britain, Ireland and five countries in Europe!

For instance:
$32.90 DOWN,
on TCA's "Fly Now—Pay Later" Plan.

Total fare: $329.00, Montreal-London 17-day Economy Excursion Jet Return.

Similar savings on all TCA jet flights to France, Germany, Switzerland, Austria, Belgium and Ireland!

$30.00 *less* by turbo-prop Britannia, in association with BOAC.

Plan *now* for the trip of your life *this fall!* See your Travel Agent or TCA.